SERVICE MANUAL

Revere

M-2

Stereo Tape Cartridge System

3M Revere-Wollensak Division
MINNESOTA MINING & MANUFACTURING CO.
320 EAST TWENTY-FIRST STREET • CHICAGO 16, ILL.

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GENERAL INFORMATION

The Revere Stereo Tape Cartridge System Model M-2 is an automatic, self-changing cartridge-type tape player/recorder that plays and records stereophonic and monophonic tape cartridges. The "Scotch" brand No. 270 completely enclosed tape cartridge used with the Model M-2 measures 3 3/4" square and contains up to 450 feet of recording tape, sufficient for up to 48 minutes of stereo sound or 96 minutes of monophonic recording. Recording speed is 1 7/8 ips, and two tracks are recorded on .146-inch wide tape. The No. 270 cartridge provides the smoothness of response, dynamic range, and extended fidelity at 1 7/8 ips equal to previous tapes playing at 7 1/2 ips. The cartridge also prevents spilling, tangling, or twisting of the tape. Each cartridge contains a leader attached to the tape for automatic threading, thus providing full recording time from the tape. Up to 20 tape cartridges may be stacked on the loading platform at one time, and once the Play key is depressed the Model M-2 will automatically play, rewind, and change cartridges for up to 15 hours of music.

The Model M-2 contains dual record and playback amplifiers, with 18 watts of combined peak output (9 watts per channel), and dual matched extended range speakers. In addition to playing back through its own sound system, the Model M-2 can be used to play back through extension speakers, through stereo and monaural phonographs and radios, and through stereo and monaural high fidelity systems. The Model M-2 will record stereo and monaural tapes from microphones; from the speaker terminals of radios, phonographs, or TV sets; from the tape outputs of high fidelity amplifiers; and from another tape recorder.

SPECIFICATIONS

Frequency Response:
40-15,000 cps ± 3 db at 1 7/8 ips

Power Output:
9 watts per channel, 5 watts continuous at 5% harmonic distortion (total 18 watts)

Signal-To-Noise Ratio:
Greater than 48 db

Wow and Flutter:
Less than 0.3%

Crosstalk:
50 db

Inputs:
Two dual hi-lo jacks (one for each channel); Microphone Input (short plug); 2-millivolts input signal level, 10-megohms impedance. Phono-Radio Input (long plug); 1-volt input signal level, 1-megohm impedance.

Outputs:
Two Auxiliary Amplifier jacks (one for each channel); 1-volt (nominal) signal level
Two External Speaker jacks (one for each channel); 8-ohms impedance

Track Width:
.045"

Playing Time:
Up to 48 minutes stereo per cartridge
Up to 1 hour and 36 minutes monophonic per cartridge

Power Consumption:
110 watts (AC only)

Size:
7" x 14 1/2" x 14 1/4" (approximately)

Weight:
32 pounds (approximately)

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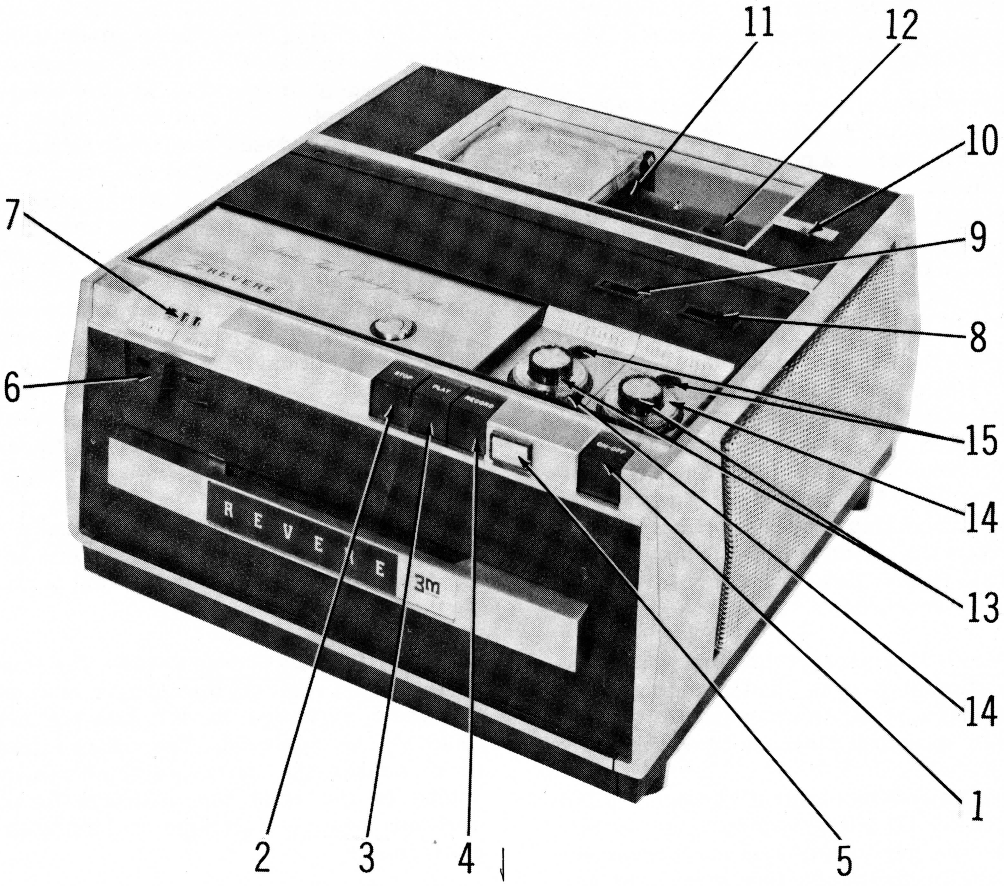

Fig. 1. Controls of Stereo Tape Cartridge System.

FUNCTIONS OF CONTROLS(Refer to Fig. 1)

Pushbuttons

(1) On-Off Key — In early production models (below Serial #3643), depressing the On-Off key applies power to both tape transport mechanism and amplifier chassis regardless of whether a tape cartridge is placed on left tape platform or not. In late production models (Serial #3643 and above), depressing the On-Off key will not apply power to the unit until or unless a tape cartridge is placed on left tape platform. Application of power is indicated by the lighting of the Tone control knobs. Depressing the key again removes power from the unit as is indicated by the absence of light emanating from Tone control knobs.

NOTE: Early Production Models (Below Serial #3643) — In early production models (no placement of cartridge required on left tape platform in order to turn unit on) application of power can be turned on or off by On-Off key as long as mechanism is engaged in mechanical function of "Load" or "Play & Record". When mechanism is engaged in any transient mode of operation (any function other than "Load" or "Play & Record"), depressing the On-Off key to remove power from the unit is automatically overridden by a switch actuated by the mechanism; power to the unit is automatically removed when mechanism cycles to the "Load" or "Play & Record" function.

Late Production Models (Serial #3643 and Above) — In late production models (require placement of cartridge on left tape platform in order to turn unit on) application of power can be turned on (On-Off key in On position and tape cartridge placed on left tape platform) or off (On-Off key in On position and no tape cartridge on left tape platform, or On-Off key in Off position with tape cartridge placed on left tape platform) as long as mechanism is engaged in mechanical function of "Load" or "Play & Record". When mechanism is engaged in any transient mode of operation (any function other than "Load" or "Play & Record") with a cartridge remaining on left tape platform, depressing the On-Off key to remove power from the unit is overridden by a switch actuated by the mechanism; power to the unit is automatically removed when mechanism cycles to the "Load" or "Play & Record" function. However, it mechanism is in a transient mode after last cartridge on left tape platform has been played or recorded and cartridge has been transferred to right tape platform, it is not necessary that the On-Off key be depressed to remove power from the unit. The switch actuated by the mechanism automatically overrides the On-Off switch, and power to the unit automatically shuts off when the mechanism cycles to the "Load" function.

(2) Stop Key — Depressing this key automatically releases a prevailing engagement of either Play or Record key, thus causing tape motion to stop.

In early production models (below Serial #3643) the stop position of the mechanism enables the recorder to be used as a public address system with or without a tape cartridge placed on left tape platform. However, in late production models (Serial #3643 and above), placement of a tape cartridge on left tape platform is required to enable public address operations with mechanism idled in the stop position.

NOTE: Depressing the Stop key will stop mechanical activity as long as mechanism is engaged in mechanical function of "Load" or "Play & Record". When mechanism is engaged in any transient mode of operation (any function other than "Load" or "Play & Record"), depressing Stop key will not immediately stop mechanism. Mechanism will continue to cycle and will not stop until either "Load" or "Play & Record" function is reached.

(3) Play Key — Depressing this key actuates the automatic tape threading cycle and simultaneously switches the playback circuits in the amplifier to perform the stereo or monaural playback operations.

(4) Record Key — A mechanical interlock called the Record Lock button (5) is incorporated into the operation of the Record key to help stop the inadvertent engagement of the Record mode, thus preventing accidental erasure of tape. Sliding Record Lock button to right enables Record key to be depressed. Depressing Record key actuates the automatic tape threading cycle (in same manner as Play key) and simultaneously switches the record circuits in the amplifier to perform the stereo or monaural record operations. When tape has automatically rewound, either at end of reel or by Reject lever, Record mode is automatically disconnected.

Other Controls

(6) Rewind-Advance Lever — This lever can only be operated while mechanism is engaged in "Play or Record" mechanical function. Sliding and holding the lever in Rewind position releases a previous engagement of the Play or Record key and causes the tape to rapidly unwind from take-up reel and wind into cartridge. Releasing the lever to its neutral position stops the rewind of tape and idles the mechanism. Sliding and holding the lever in the Advance position also releases a previous engagement of the Play or Record key and causes the tape to rapidly unwind from cartridge and wind onto take-up assembly. Releasing the lever to its neutral position stops the advance of tape and idles the mechanism. In this manner, the tape can be inched along in either direction to find an exact point on the tape. To re-engage the Play or Record mode after Rewind and/or Advance, it becomes necessary to depress the Play or Record key.

NOTE: When rewinding manually, never stop with index counter reading below "004" until end of tape leader is heard whipping inside cartridge. Thereafter, the Play key and Reject lever can be actuated for safe and continued operation.

(7) Index Counter — The Index Counter becomes operative during the Play or Record mode and also during Rewind-Advance lever operations. With the Index Counter originating at zero before starting to record or play back a tape cartridge, program material can be indexed at various points in tape travel by taking note of Index Counter reading. Thereafter, the Rewind-Advance lever may be used to quickly relocate a selection on the tape by returning tape to the afore noted Index Counter reading. Rejecting the cartridge, or allowing the tape to completely withdraw from cartridge during the Play or Record mode, automatically returns the Index Counter to zero when automatic rewind of cartridge starts.

(8) Reject Lever — Sliding this lever to left stops tape transport in either the Play or Record mode and automatically rewinds tape into cartridge.

(9) Mechanical Function Indicator — Programs the mechanical operation of mechanism so that operator may know what function is being performed at any particular time.

(10) Repeat-Change Lever — The Repeat position of this lever controls the changer mechanism so that the same cartridge on left tape platform may continuously be replayed. The Change position of the lever causes the cartridge which was last played to unload to the right tape platform, thus allowing the next consecutive cartridge to be placed on left tape platform.

NOTE: The Change feature of cartridges is primarily designed for use in conjunction with Play mode of operation.

(11) Left Tape Platform — Left tape platform holds the stack of cartridges which are to be played or recorded. Two switches associated with the platform are actuated by cartridge when mechanical function indicator is in "Load" position. The actuation of these switches, coupled with the engagement of the Play or Record key, automatically threads the machine and initiates the mechanism cycle.

(12) Right Tape Platform — The right tape platform accepts and stacks the cartridges which are changed from left tape platform.

(13) Right-and Left-Channel Volume Controls — Clockwise rotation of either Volume knob turns on record/playback circuits of its respective channel and simultaneously adjusts volume level of channel for record, playback, and P.A. operations. Turning either Volume control Off shuts off record/playback circuits of its respective channel. This feature permits two independent monaural recordings to be made without erasing material previously recorded on other channel. For stereo recordings, both Volume controls are turned on. With the Volume controls turned Off, tape may be transported without sound reproduction in Play mode; in Record mode tape may be transported without recording new sound and without erasing tape.

(14) Right-and Left-Channel Tone Controls — This control regulates the tonal qualities of its respective channel for playback and public address operations only. It is inoperative in the Record mode. The Tone control is designed to give four distinct tonal extremes and can be varied continuously between them.

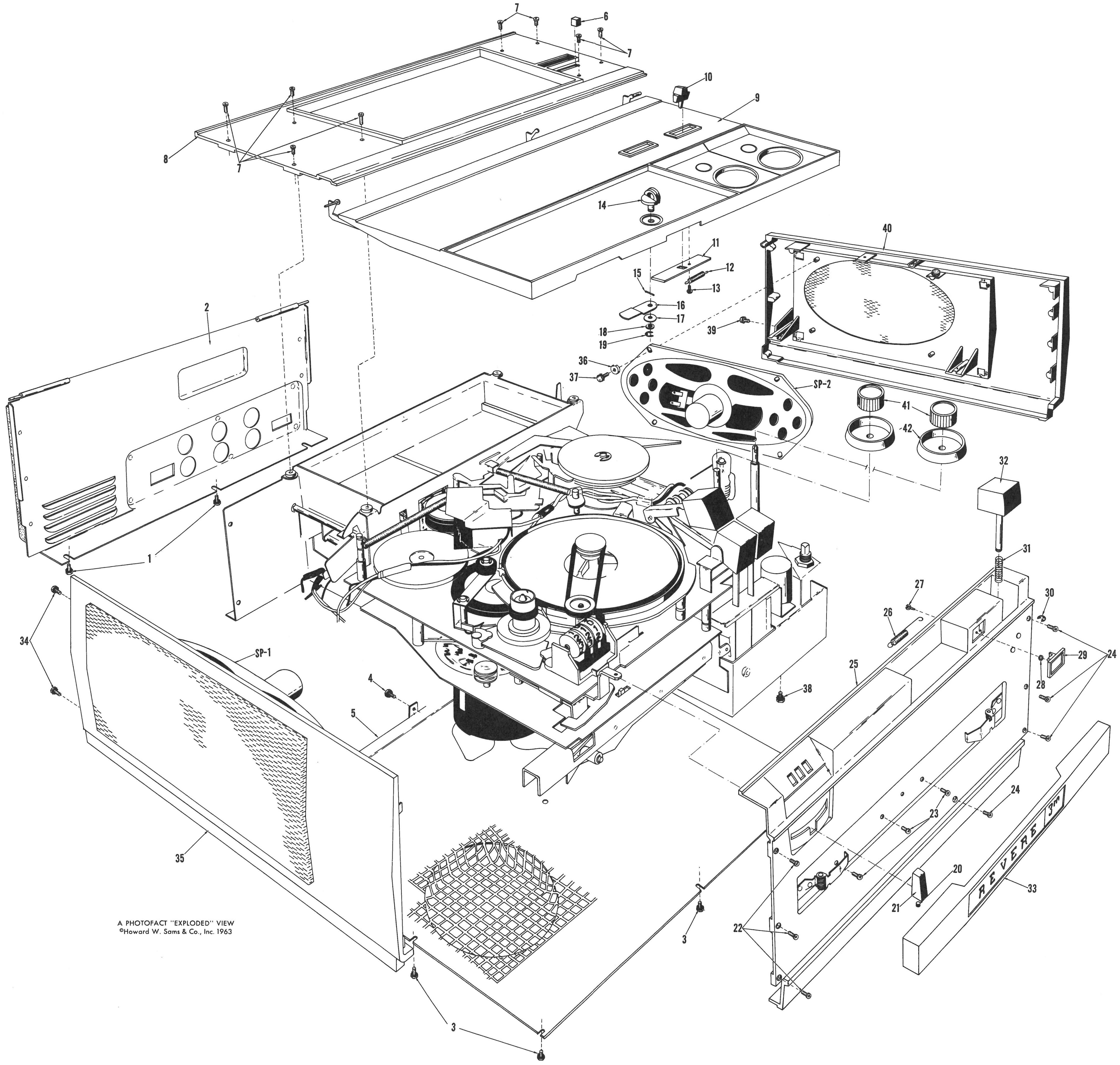

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Fig. 2. Case Disassembly Exploded View.

In "Balanced Tone" position the response of the amplifier and speaker are co-ordinated to emphasize the very high and low tones. The degree of emphasis varies with the Volume control setting. In "Bass" position the highs are cut off, and the very low frequencies are emphasized. In "Treble" position the lows are cut off, and the very high frequencies are emphasized. The "Hi-Fi" position produces the widest uniform response when connecting the recorder to auxiliary equipment.

(15) Right-and Left-Channel Record Level Indicators — This indicator is used in the Record mode to give a visual indication of the correct volume setting of its respective channel when making recordings. The Volume control should be adjusted so that the left or "Normal" half of the indicator flashes during soft passages, and the right or "Distort" half remains darkened during loud passages. The proper recording level should be preset with the recorder idled in the Stop position and the Tone control turned to "Treble".

Rear Panel Controls and Input Output Connections

P.A./Monitor-Record Microphone — This is a slide switch which controls the output of both right-and left-channel speakers (and External Speaker jacks) when recorder is operated in either the Stop (P.A.) or Record mode. With switch in Record Microphone position, internal or external speakers are silenced in the Record or Stop (P.A.) mode. With switch in P.A./Monitor position, internal or external speakers are connected so that recorder may be used as a public address system (P.A.) in Stop mode, or so that program material can be monitored at a reduced level in Record mode. The switch has no control of internal or external speakers in Play mode.

Left-and Right-Channel Input Jacks — These jacks are used in Record mode to connect the audio signals from a microphone, radio, phonograph, or some other suitable source, into its respective channel for the purpose of making either monaural or stereo recordings. The proper input circuit is automatically selected by the different lengths of input plugs. The microphone input should be terminated in a short (1") phone plug to connect to a low level, high impedance input circuit. The Radio or Phonograph input should be terminated in a longer plug (1 3/16") to connect to a higher level, low impedance input circuit.

Left-and Right-Channel External Speaker Jacks — These jacks are used to connect an external speaker or earphone to the output of its respective channel. The terminating plug of external speaker or earphone automatically disconnects the associated internal speaker.

Left-and Right-Channel Auxiliary Amplifier Jacks — These jacks are used in Play mode to connect the preamplified output of its respective channel to an external amplifier system for further amplification and final sound reproduction. When connecting to auxiliary systems, recorder's Tone control should be set to "Hi-Fi" position; Volume control should be set so that "Normal" half of record level indicator flashes. Connecting into Auxiliary Amplifier jack mutes its respective internal speaker. P.A./Monitor - Record Microphone switch has no effect on operation of auxiliary amplifier. Signal may only be derived from Auxiliary Amplifier Jacks when Play mode is engaged.

DISASSEMBLY INSTRUCTIONS

To Service Amplifier Tubes

A. To service 6EU7 tubes (V1, V2, V4, V5, Fig. 3)

1. Unlatch top cover panel (Ref. #9, Fig. 2) and swing panel up.

2. Left (V1, V2,) and right (V4, V5) channel 6EU7 tubes are now accessible for servicing.

B. To service 7591 (V3, V6, Fig. 3) and 6C4 (V7, Fig. 3) tubes.

1. Turn unit over on either its left or right side.

2. Remove 3 screws (Ref. #1, Fig. 2) from bottom of back panel (Ref. #2, Fig. 2) and swing panel up.

3. Left (V3) and right (V6) channel 7591 tubes and 6C4 tube (V7) are now accessible for servicing.

NOTE: A tube placement chart on underside of top cover panel shows location of amplifier tubes and pilot lamp.

Case Disassembly (See Fig. 2)

1. Remove 3 Sems screws (1) from bottom of back panel (2) and swing panel up. Remove remaining 7 Sems screws (3) and 2 hex head screws (4) from bottom cover (5). Remove bottom cover.

2. Pull up and remove Repeat-Change knob (6). Remove 8 screws (7) from top bezel and nameplate assembly (8). Unlatch top cover panel (9). Lift and simultaneously remove hinged top cover panel (9) and top bezel and nameplate assembly (8). Remove hinged rear panel (2).

3. Remove screw (20) from Rewind-Advance knob (21) and pull knob to remove. Remove 10 screws (22, 23, 24) from front casting (25); Remove handle (33) by unlatching hinges from pins in handle in order to gain access to three screws (23) which are located beneath case handle assembly (33). Depress all three keys and pull front casting assembly to drop clear of Rewind-Advance lever. Remove from casting assembly.

4. Remove left speaker plug from amplifier chassis. Remove 2 Sems screws (34) which secure the left side casting assembly (35). Remove left side casting assembly.

5. Remove right speaker plug from amplifier chassis. Remove 2 Sems screws (38) from beneath right-hand side of amplifier chassis (See Fig. 4). Remove Sems screw (39). Remove right side casting assembly (40).

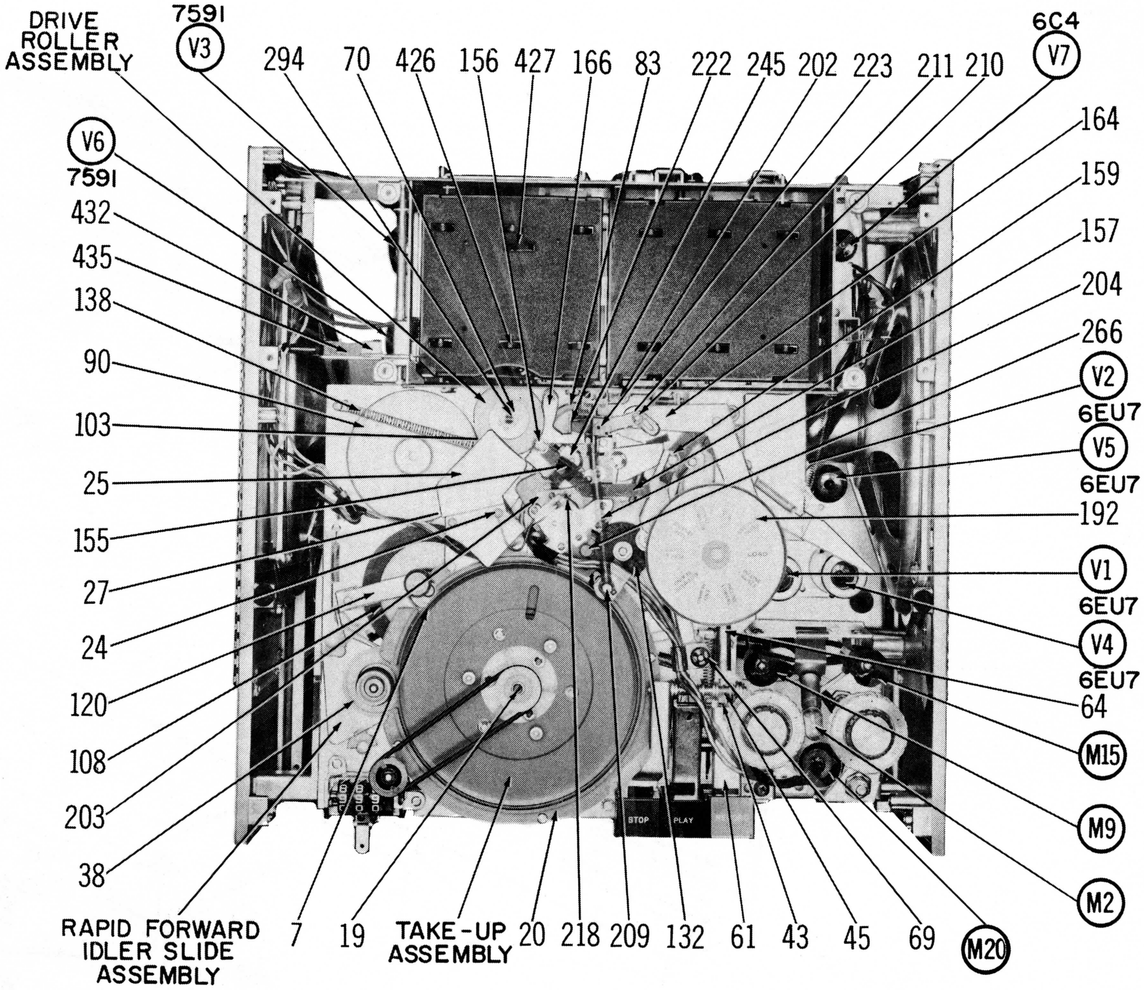

Fig. 3. Top View of Unit with Case Partially Disassembled.

To Remove Master Mechanism Assembly (Fig. 5) from Amplifier Chassis (Fig. 20)

6. Remove head plug (M20, Fig. 3) from amplifier chassis.

7. Remove interconnecting 4-prong power plug (M24, Fig. 4) from amplifier chassis.

8. Remove 4 amplifier mounting screws (Fig. 4) from beneath amplifier chassis. Remove master mechanism assembly from amplifier chassis.

Master Mechanism Disassembly (Fig. 5)

A. To remove changer assembly (Fig. 5)

9. Refer to Fig. 5 and remove "E" ring (330) from incline lifter arm shaft (430).

10. Refer to Figs. 3 and 18 and proceed as follows:

    In early production models (below Serial #3643), unsolder the 2 yellow wires connected to one of the terminals on tape cartridge sensing switch (435). Remove solderless connector which interconnects red wire to tape platform switch (Ref. #422, Fig. 7). Untwist and separate interconnecting red wires.

    In late production models (Serial #3643 and above), unsolder the 2 yellow wires and the red wire connected to the terminals on tape cartridge sensing switch (435). Remove solderless connectors which interconnect the black and green wires to the tape platform switch (Ref. #422, Fig. 7). Untwist and separate interconnecting black and green wires. Remove pieces of tape and retaining clamp so that disconnected black and green wires can be removed from wiring cable.

11. Loosen retaining clamps from around wiring cable and remove cable from changer assembly.

12. Refer to Figs. 5 and 16 and proceed as follows: Remove "E" ring (337) which retains transfer crank arm assembly (344). Remove center "E" ring (329) which retains transfer link (345). Clear parts (344 and 345) and remove changer mounting screw (319). Set Repeat - Change lever to Change position and manually turn mechanical function indicator (Ref. #192, Fig. 3) to "Incline Lowers" position. Remove changer mounting screw (319-1).

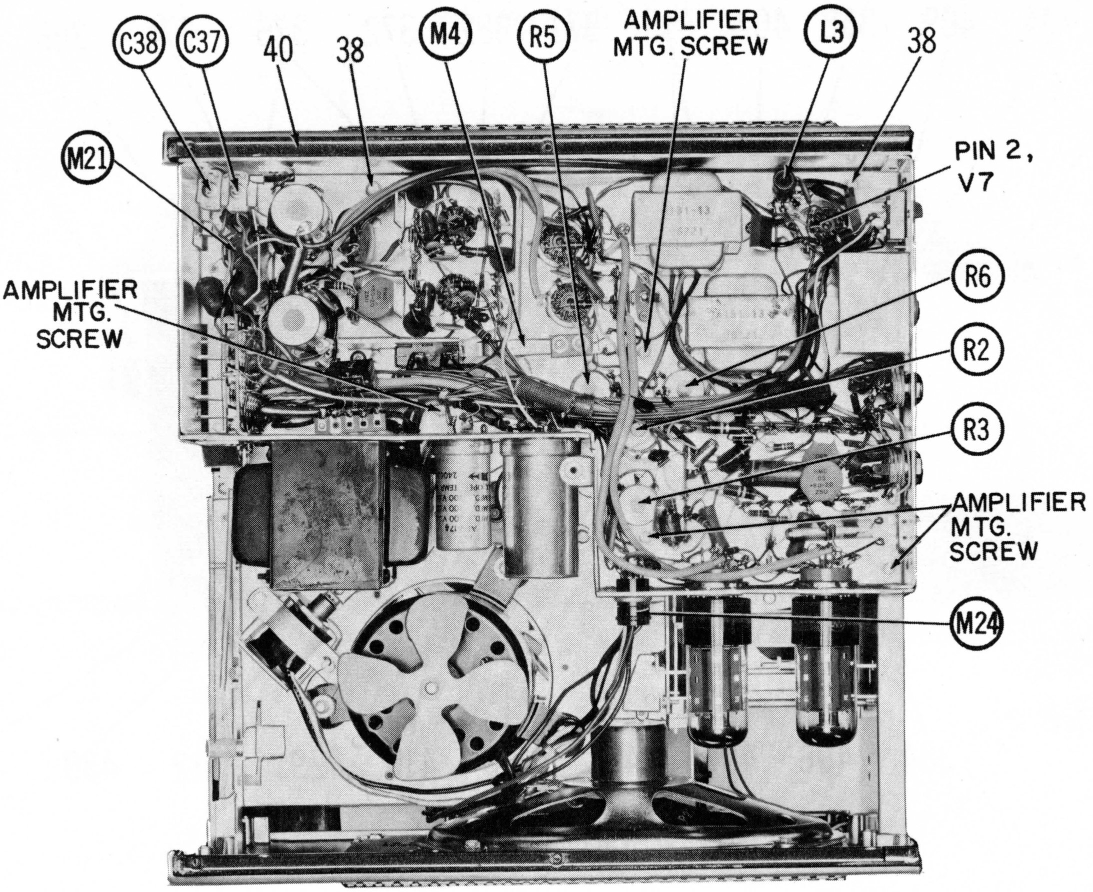

Fig. 4. Bottom View of Unit with Case Partially Disassembled.

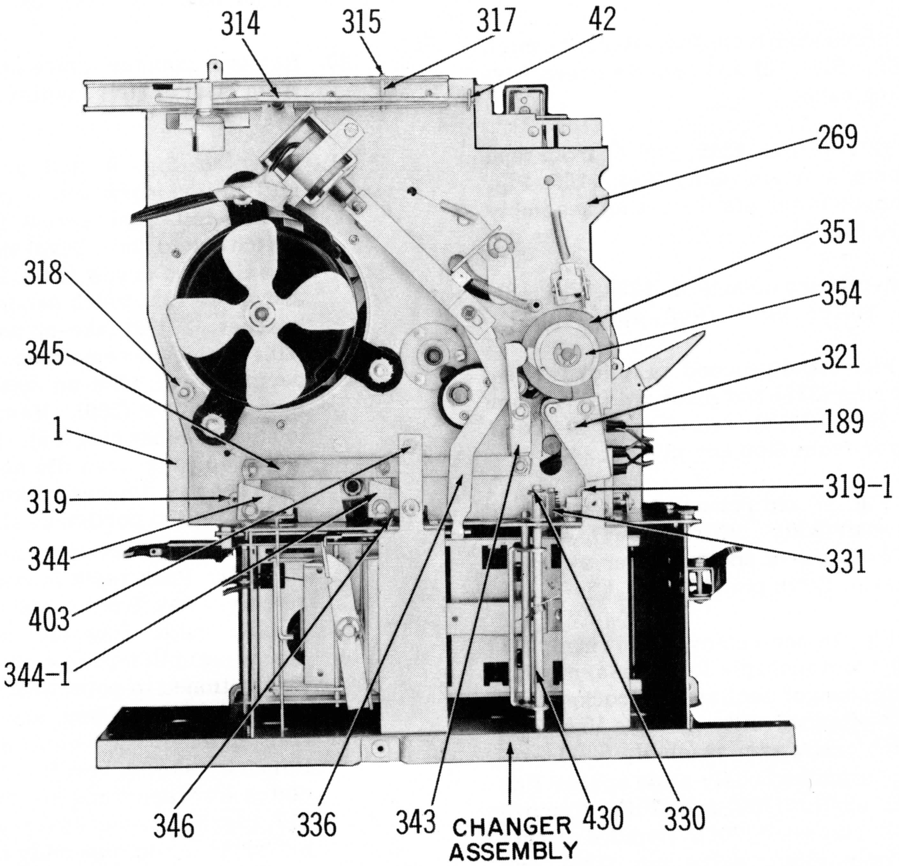

Fig. 5. Bottom View of Master Mechanism Assembly with Amplifier Chassis Removed.

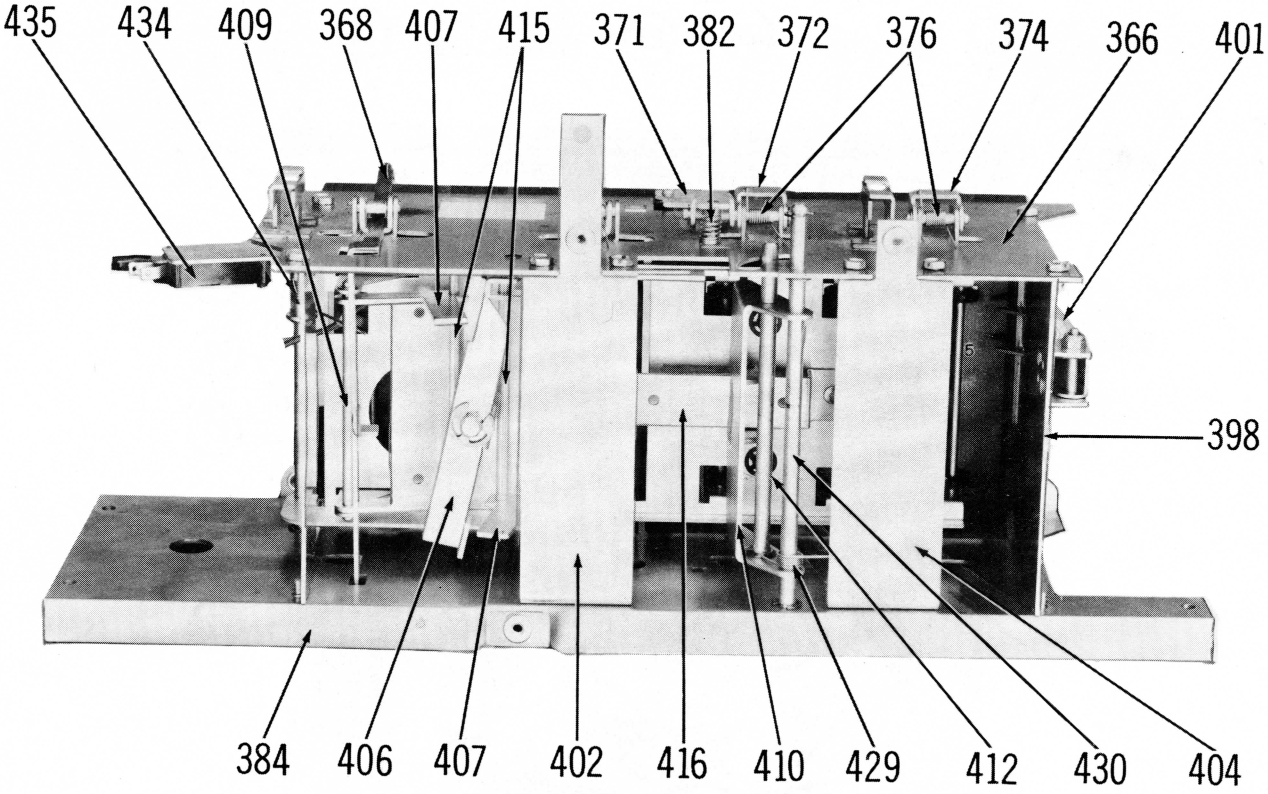

Fig. 6. Changer Assembly.

B. To remove upper plate riveting assembly (Ref. #1, Fig. 8) from lower plate riveting assembly (Ref. #269, Fig. 13).

13. Unsolder green wire from Play-Record switch (Ref. #189, Fig. 10) and remove green wire from wiring cable.

14. Remove "E" ring (Ref. #346, Fig. 5) from tape loop forming arm assembly (Ref. #166, Fig. 8) at bottom of lower plate riveting assembly (Ref. #269, Fig. 5).

15. Remove on-off wire form (Ref. #298, Fig. 13), from key roller slide (Ref. #53, Fig. 11).

16. Refer to Fig. 5 and proceed as follows: Remove "E" ring (315) and pivot pin (317) from search lever (314) detent arm. Remove search lever from Stop key plunger (42).

17. Refer to Fig. 16 and remove following from cam stack shaft (200): "E" ring (356), washer (355), cartridge pawls and amplifier switches cam (354), and drive pin (353).

18. Refer to Fig. 16 and remove following: "E" ring (325) from multiple follower arm shaft (201); slide changer incline cam rocker arm (321) — with attached lifter incline link (326) and transfer crank arm assembly (331) — off shaft (201); simultaneously slide spacer link (352) from shafts (200) and (201). Remove spacer (320) from shaft (201). Remove ratchet cam assembly (351), drive pin (350), and ratchet drive and stud assembly (349) from cam stack shaft (200).

19. Remove "E" ring (Ref. #70, Fig. 3) from drive roller shaft (Ref. #294, Fig. 3). Remove drive roller assembly (Fig. 3).

20. Remove counter drive belt (Ref. #5, Fig. 8) from counter drive pulley. (Ref. #4, Fig. 8).

21. Refer to Fig. 8 and proceed as follows: Entirely remove right-hand screw (24) and loosen left-hand screw (23) from loop arm switch shield (25). Pivot shield (25) clockwise on left-hand screw (23). Remove screw (28) and screw (29) which secure loop arm switch bracket (30) to take-up assembly guide ring (20). Remove remaining screws (31) from periphery of take-up assembly guide ring. Remove screw (209). Remove circular self-locking retainer ring (69). Remove head cable from working area (Do not disconnect cable from heads). Unscrew take-up reel shaft (19) until threaded portion of shaft has withdrawn from lower plate riveting assembly (Ref. #269, Fig. 13). Push rapid forward idler slide assembly away from periphery of take-up assembly guide ring (20) and turn guide ring clockwise until tape slot opening in guide ring is positioned to point where clearance is allowed past Stop key arm (57). Lift entire take-up assembly to clear past Stop key arm. Remove take-up belt (Ref. #18, Fig. 9) from clutch drive drum and felt pad assembly (Ref. #17, Fig. 9). Remove take-up assembly. Removal of take-up assembly now allows access to Sems mounting screw (Ref. #149, Fig. 9). Remove screw (149) from upper plate riveting assembly (Ref. #1, Fig. 9).

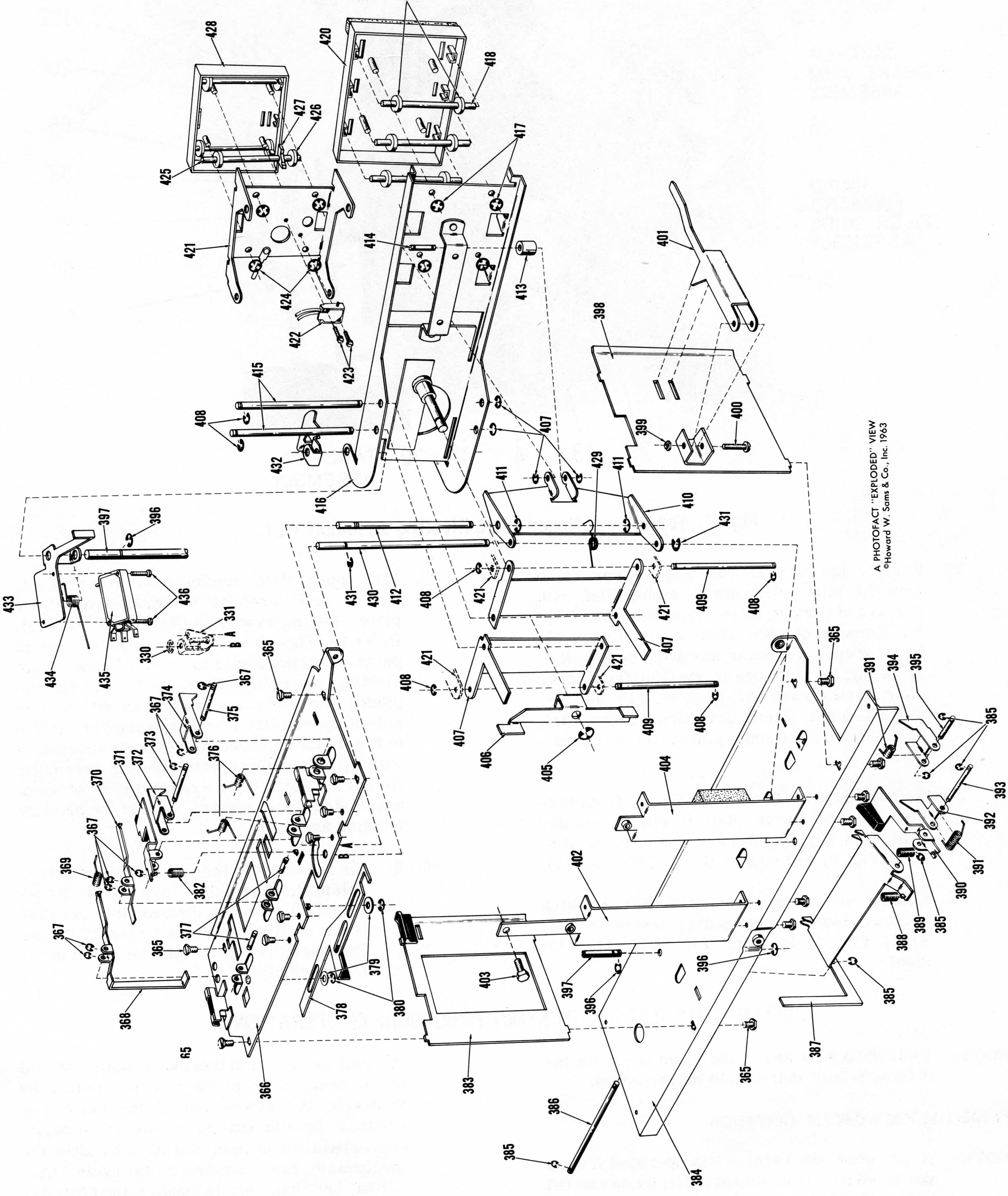

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Fig. 7. Exploded View of Changer Assembly.

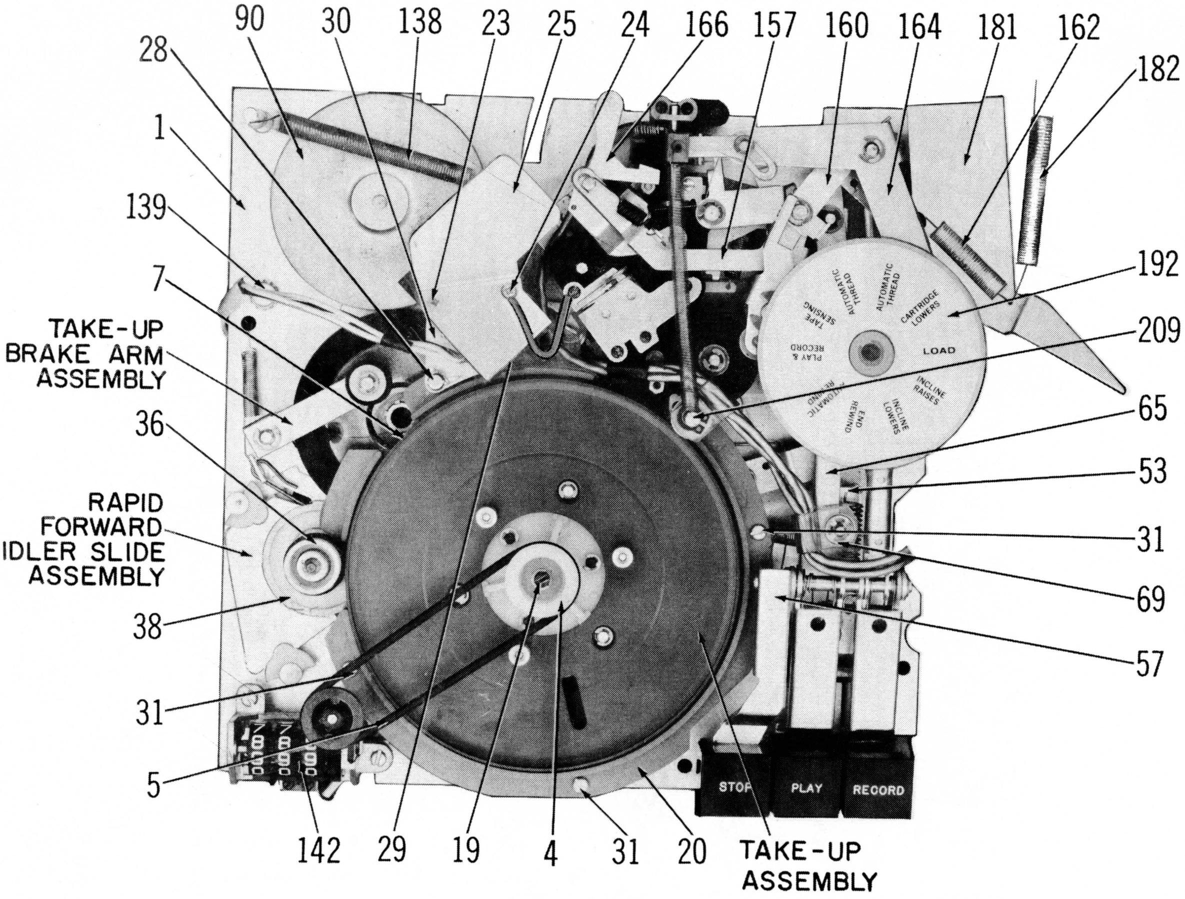

Fig. 8. Top View of Upper Plate Riveting Assembly (1).

22. Remove spring (Ref. #41, Fig. 9) from rapid forward idler slide pin assembly (Ref. #40, Fig. 9) and remove idler slide assembly (Fig. 8). Removal of idler slide assembly now allows access to Sems mounting screw (Ref. #150, Fig. 9). Remove screw (150) from upper plate riveting assembly (Ref. #1, Fig. 9). Remove 5 other Sems mounting screws (Ref. #151, Fig. 9) from upper plate riveting assembly.

23. Remove Keps nut (Ref. #318, Fig. 5) from bottom side of lower plate riveting assembly (Ref. #269, Fig. 5). Remove Sems screw (Ref. #139, Fig. 8) and spacer (Ref. #255, Fig. 12).

24. Loosen set screw (Ref. #109, Fig. 9) which secures motor drive pulley assembly (Ref. #108, Fig. 3) to motor (Ref. #360, Fig. 13) shaft.

25. Lift upper plate riveting assembly (Ref. #1, Fig. 8) and carefully withdraw from lower plate riveting assembly (Ref. #269, Fig. 13). Refer to Figs. 9 and 10 for exploded view of parts associated with top side of upper plate riveting assembly. Refer to Fig. 12 for exploded view of parts associated with bottom side of upper plate riveting assembly. Refer to Fig. 14 for exploded view of parts associated with top side of lower plate riveting assembly. Refer to Fig. 16 for exploded view of parts associated with bottom side of lower plate riveting assembly.

NOTE: To reassemble the unit ("Master Mechanism Reassembly" thru "Case Reassembly"), reverse disassembly instructions outlined in Steps 1 thru 25 ("Case Disassembly" thru "Master Mechanism Disassembly").

PRELIMINARY TESTS: CHECK-OUT PROCEDURE OF OPERATIONS

NOTE: Failure to pass any of the following tests indicates a fault that should be remedied.

Preparing Recorder for Operation

NOTE: If or when the recorder is operated from a power source that is controlled by an On-Off wall switch, the recorder should first be allowed to complete its cycle (mechanism should return to "Load" function) before shutting off the wall switch. Furthermore, power should not be removed from the recorder (either by removing the power cord from rear of recorder or by removing power cord from power source) while it is in operation until after the mechanism has completed its cycle to the "Load" function. In this manner, the recorder will not be left in a cycling mode with power removed. Nevertheless, as a precautionary measure before operating the recorder, ob-

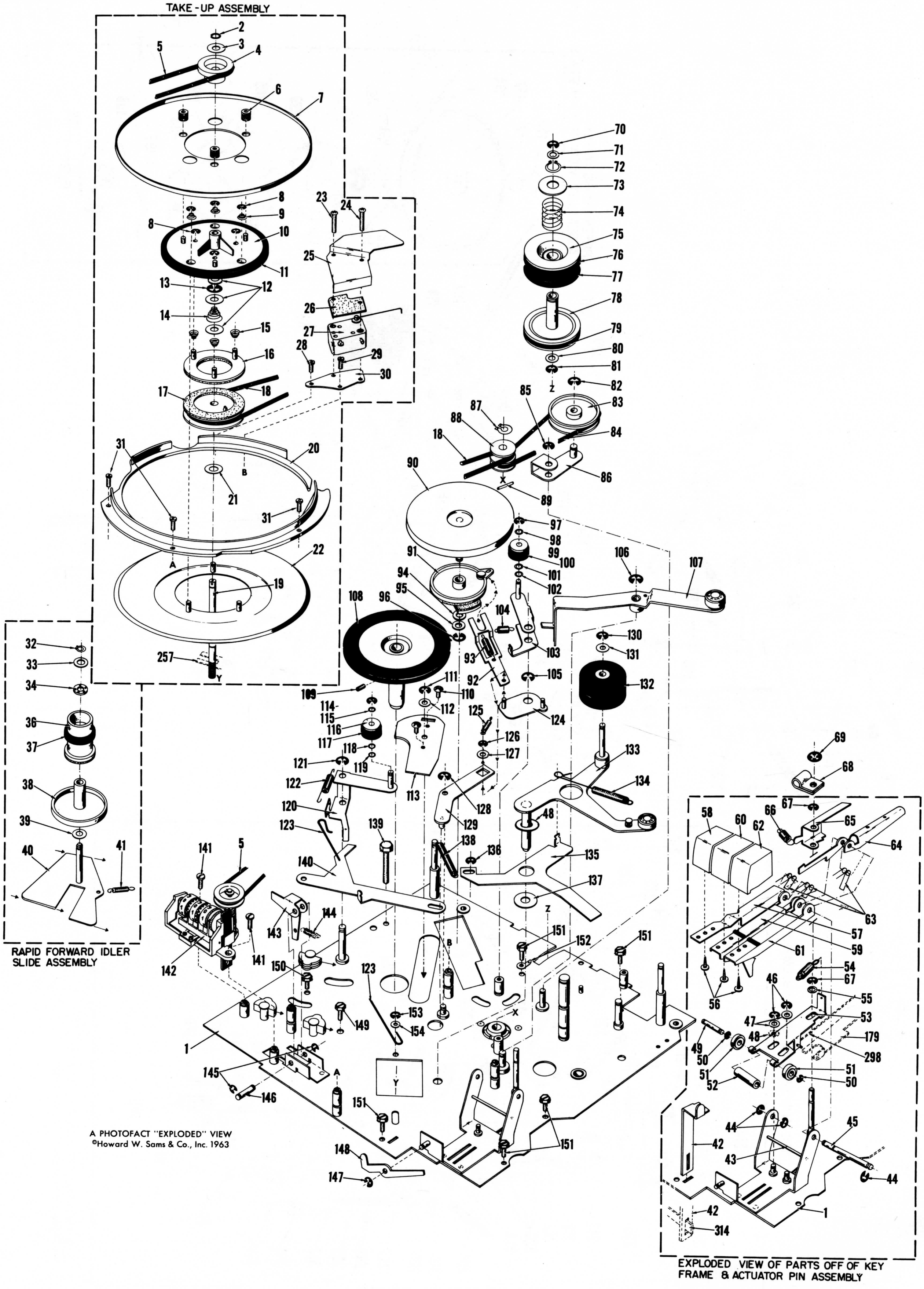

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Fig. 9. Partial Exploded View — Top Side of Upper Plate Riveting Assembly (1).

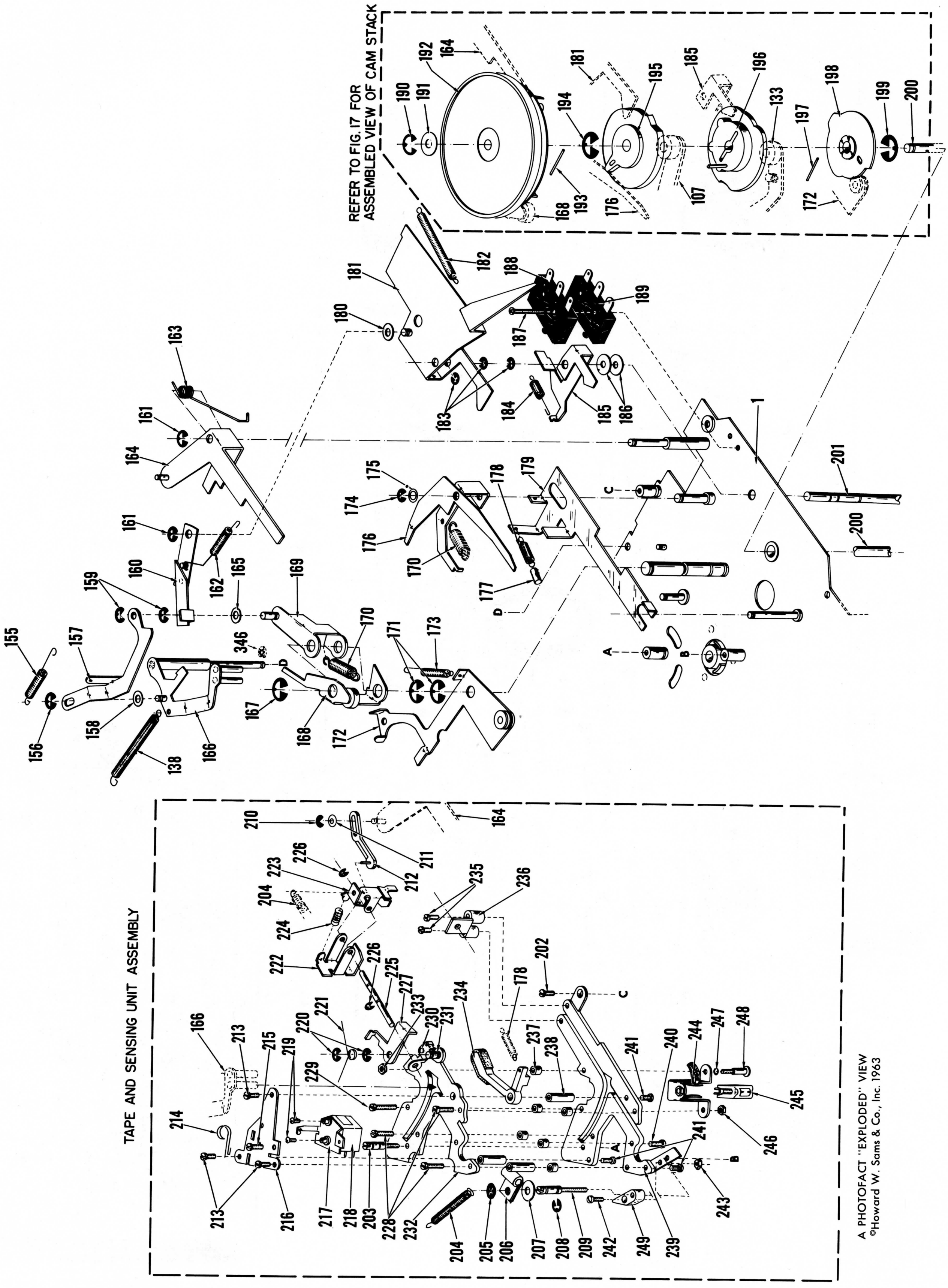

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Fig. 10. Partial Exploded View — Top Side of Upper Plate Riveting Assembly (1).

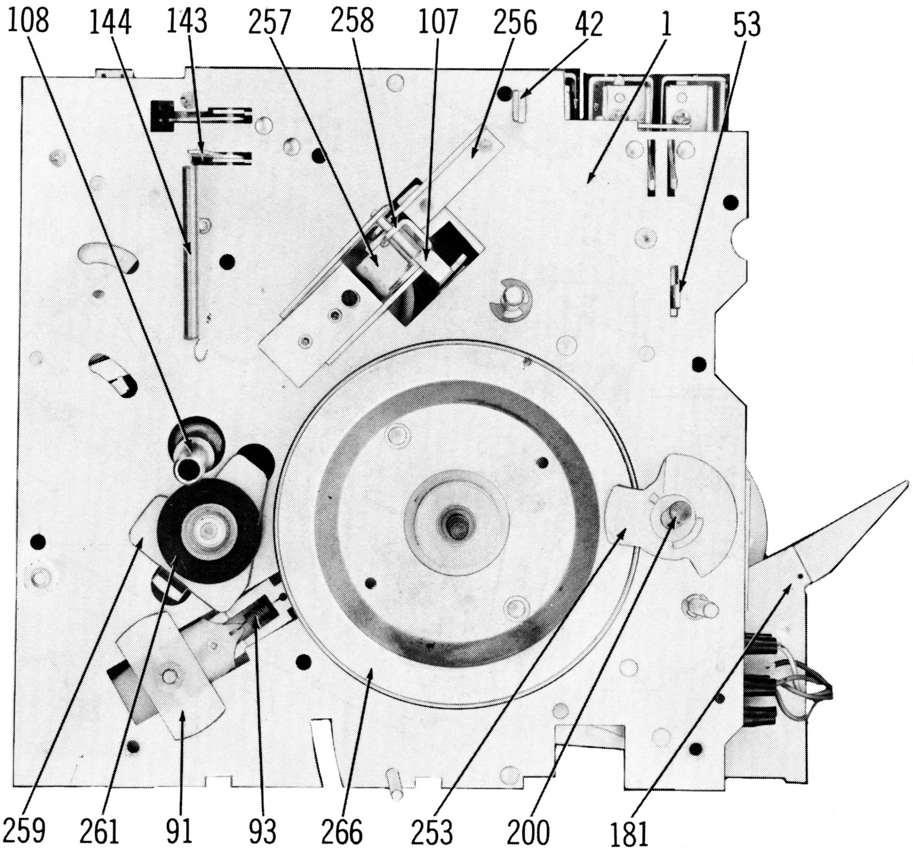

Fig. 11. Bottom View of Upper Plate Riveting Assembly (1).

serve through window in top cover panel to see if mechanical function indicator of recorder has been previously cycled to the proper position, as will be indicated by the word "Load" appearing in the window. If a mechanical function other than "Load" appears in the window, unlatch top cover panel and hinge it up. Manually turn the top cam (mechanical function indicator) in a clockwise direction to the position which will align the "Load" function with the window in the top cover panel.

1. Use the power cord provided and connect the recorder to a power source supplying 105-120 VAC at 60 cps.

2. Stack tape cartridges which are to be played or recorded on the left tape platform. Stack cartridges so that curved opening (exposing tape reel) faces the front of the recorder and tape feed-thru slot in corner of cartridge is positioned at right side of tape platform.

3. Depress Stop key. Depress On-Off key. A light should emanate from Tone control knobs to indicate when the recorder is turned on. The mechanism motor should start running, and the amplifier tubes should light up.

Public Address Operation

4. Public Address Through Left Channel — With the recorder idled in the Stop position, slide P.A./Monitor-Record Microphone switch to P.A./Monitor position. Insert microphone plug (short plug) firmly into Left-Channel Input jack. Turn up Left-Channel Volume control and speak into microphone. Sound should be audible from left speaker only. Moving microphone closer to left speaker (with volume control set at sufficient level) should cause feedback and howling. Insert an external speaker into Left-Channel External Speaker jack. Left speaker in recorder should be silenced. Public address should now be audible through external speaker. Sliding P.A./Monitor-Record Microphone switch to Record Microphone position should silence either internal or external speaker.

5. Public Address Through Right Channel — Use controls, jacks, etc. associated with Right Channel, and repeat procedures for P.A. as outlined in Step 4 above.

To Record

6. To make a stereo recording from microphones, radio, television, AM-FM tuner, auxiliary amplifier, phonograph, etc., use proper length attachment plugs and connect the input signals from stereo sound-producing source into their respective Left- and Right-Channel Input jacks at rear of recorder. To make a monaural recording (same material simultaneously recorded on both channels) from any of the above mentioned sound-producing devices, use proper length attachment plugs and purchase or fabricate a "Y" signal adaptor. Connect the monaural input source through "Y" adaptor to both Left- and Right-Channel Input jacks.

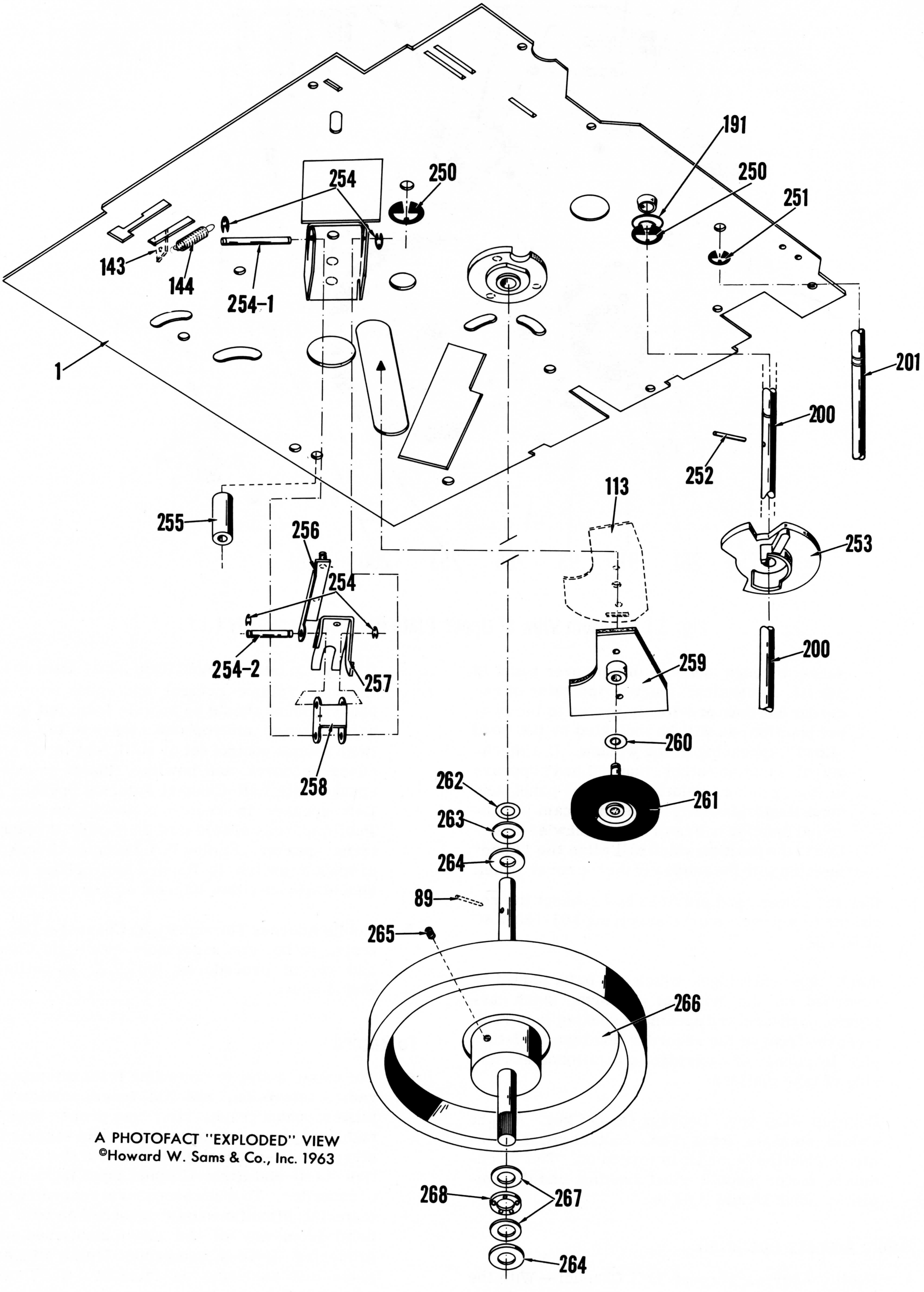

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Fig. 12. Exploded View — Bottom Side of Upper Plate Riveting Assembly (1).

7. Depress Play Key. Rubber tire on take-up brake arm (Ref. #120, Fig. 3) should release top flange (Ref. #7, Fig. 3) of take-up assembly. Drive roller assembly (Fig. 3) should release supply reel in cartridge. Mechanism should be cycled so that mechanical function indicated through window in top cover panel progresses from "Load" position through positions of "Cartridge Lowers", "Automatic Thread" (2 positions), and "Tape Sensing" before it automatically stops at the "Play & Record" position. During the preceding mechanical functions, the following mechanical activity should have occurred:

   a. "Load" position—Tape cartridge at bottom of stack should drop onto left tape platform. Rewind-Advance lever and Reject lever should be "locked out" so that they cannot be operated. Audio circuits in amplifier should be unmuted.

   b. "Cartridge Lowers" Position—Tape cartridge on left tape platform should lower into playing position, and remaining stack of cartridges should be held in an elevated position above left tape platform. Rewind-Advance lever should remain "locked out" of operation. Reject lever can now be actuated, but its operation should produce no effect on the mechanical cycling at this time. Audio circuits in amplifier should be muted.

   c. Automatic Thread (2 positions) — Cartridge drive roller pulley (Ref. #83, Fig. 3) should engage drive roller assembly (Fig. 3). Drive roller assembly should drive supply reel in cartridge to cause tape leader to eject from feed-thru slot in cartridge and be wound onto take-up assembly (Fig. 3) without spillage. Rewind-Advance lever should remain "locked out" of operation. Reject lever can now be actuated, but its operation should produce no effect on mechanical cycling at this time. Audio circuits in amplifier should be muted.

   d. "Tape Sensing" position — Drive roller assembly (Fig. 3) should release supply reel in tape cartridge. Cartridge drive roller pulley (Ref. #83, Fig. 3) should disengage drive roller assembly. When the tape reaches tape loop forming arm assembly (Ref. #166, Fig. 3) the arm assembly should pull tape across surfaces of erase head (Ref. #245, Fig. 3) and play/record head (Ref. #218, Fig. 3). Pressure roller (Ref. #132, Fig. 3) should contact capstan-flywheel assembly (Ref. #266, Fig. 3) to smoothly drive tape at a constant rate of speed from supply reel, past the heads, and onto take-up assembly (Fig. 3) without spillage. Rewind-Advance lever should remain "locked out" of operation. Reject lever can still be actuated, but its operation should produce no effect on mechanical cycling at this time. Audio circuits in amplifier should be muted.

   e. "Play & Record" position — Tape should continue to smoothly unwind from tape cartridge and wind onto take-up assembly at playing speed without spillage. Index counter should become operative to tally each revolution of take-up assembly. Rewind-Advance lever can now be operated to manually rewind or advance the tape at a fast rate of speed. The Reject lever can now be actuated to cause "Automatic Rewind" of the cartridge. Audio circuits in amplifier should be unmuted.

NOTE: In order to continue with the check-out procedure for the Record mode, do not operate Rewind-Advance lever or Reject lever at this time.

8. With the recorder engaged in the "Play & Record" mechanical function, depress Stop key. Play key should release. Rubber tire on take-up brake arm (Ref. #120, Fig. 3) should engage top flange (Ref. #7, Fig. 3) of take-up assembly, and drive roller assembly (Fig. 3) should simultaneously engage supply reel in cartridge to bring the tape to a smooth stop without spilling. Pressure roller (Ref. #132, Fig. 3) should also disengage capstan-flywheel assembly (Ref. #266, Fig. 3).

9. Set Right- and Left-Channel Tone controls to "Treble" position.

10. With signal being fed into the Left - and Right-Channel Input jacks at rear of recorder, preset the record volume level by adjusting Left- and Right-Channel Volume controls so that "Normal" halves of Left- and Right-Channel Record Level Indicators flash, but no flashing occurs at "Distort" halves.

11. Slide P.A./Monitor-Record Microphone switch to Record Microphone position.

12. Slide Record Lock button to the right and simultaneously depress Record key. Tape should smoothly unwind from cartridge and wind onto take-up assembly at recording speed without spillage. Index counter should tally each revolution of the take-up assembly. Note index counter reading and record a short monaural or stereo selection of program material on the tape. Slide P.A./Monitor-Record Microphone switch to P.A./Monitor position and monitor program material as it is being recorded on the tape. Program material being recorded should be audible from recorder's speakers. NOTE: If recording is being made from microphone(s) distortion (feedback and howling) may result if microphone picks up audible output of recorder. Return P.A./Monitor-Record Microphone switch to the Record Microphone position.

13. Depress Stop key at end of recording time. Note index counter reading. Record key should release and brakes should be applied to smoothly stop the tape without spillage. Pressure roller (Ref. #132, Fig. 3) should also disengage capstan-flywheel assembly (Ref. #266, Fig. 3).

14. Slide and hold Rewind-Advance lever to the left. Take-up brake arm (Ref. #120, Fig. 3) should disengage top flange (Ref. #7, Fig. 3) of take-up assembly. Rewind idler (Ref. #90, Fig. 3) should simultaneously engage motor drive pulley (Ref. #108, Fig. 3) and drive roller assembly (Fig. 3) to cause tape to rapidly unwind from take-up as-

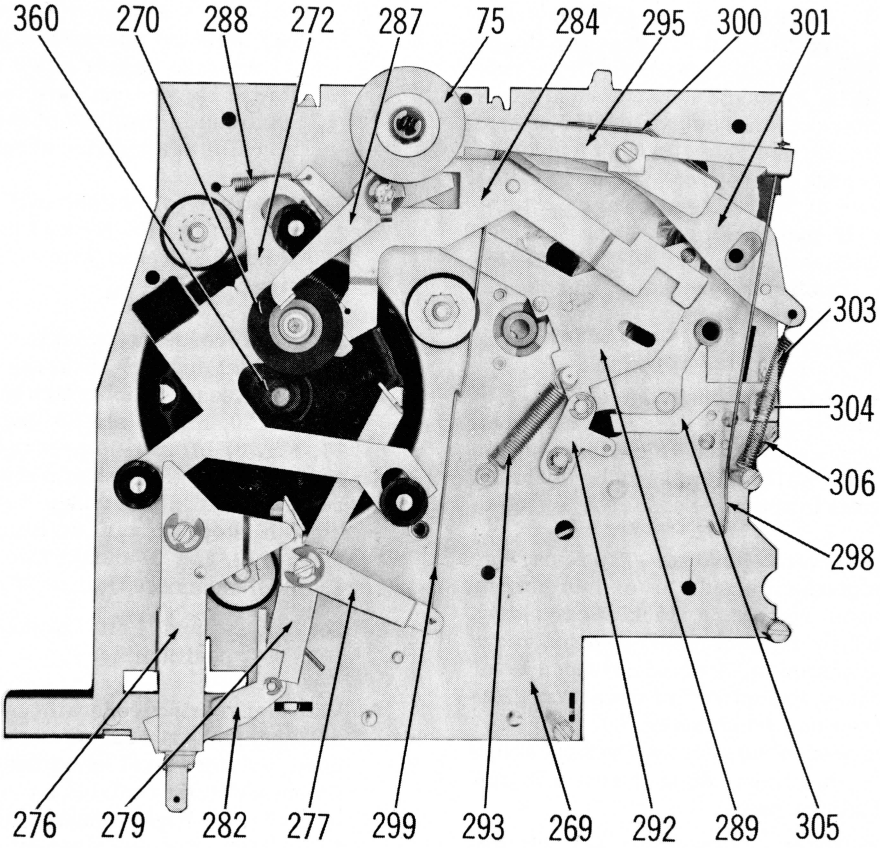

Fig. 13. Top View of Lower Plate Riveting Assembly (269).

sembly and wind into cartridge. No sound should be heard from speakers. Continue rewinding tape until index counter reading previously noted at beginning of recording (Step 12) is obtained. Release Rewind-Advance lever. Lever should automatically return to its center or neutral position and brakes should be applied to stop tape transport.

15. Turn Right- and Left-Channel Volume controls to Off position. Depress Record key. Pressure roller should contact capstan, brakes should release, and transport of tape should progress from cartridge onto take-up assembly. Continue tape transport in Record mode until index counter reaches the reading previously noted at end of original recording (Step 13). NOTE: The procedure in this step should disable the record circuits in the amplifier and should thus prevent erasure of original recording made in Step 12. Refer to Step 16 for check-out of procedure in Step 15.

To Play Back the Recording

16. Repeat Step 14. Depress Play key. Pressure roller should contact capstan, brakes should release, and transport of tape should progress from cartridge onto take-up assembly at playing speed. Turn on Right- and Left-Channel Volume controls. Adjust Volume and Tone controls and listen to playback of recording. Check volume, tone, and overall quality. Turn off Left-Channel Volume control. Sound should only be audible from right speaker. Turn on Left-Channel Volume control and turn off Right-Channel Volume control. Sound should only be audible from left speaker. Adjust Volume controls so that "Normal" halves of record level indicators flash. Set Tone controls to "Hi-Fi" position. Connect the Right- and Left-Channel Auxiliary Amplifier jacks of recorder to an auxiliary stereo or monaural amplifier/speaker system. If a monaural amplifier is used, alternately check playback from Fight and Left Channels. Inserting connecting plug into Left-Channel Auxiliary Amplifier jack should silence left speaker in recorder. Inserting connecting plug into Right-Channel Auxiliary Amplifier jack should silence right speaker in recorder. Adjust volume and tone controls on auxiliary amplifier for final listening pleasure, and check quality of sound reproduction through auxiliary amplifier/speaker system.

Making a New Recording Over Original Recording

17. After original recording has finished playing in Step 16, remove connections from Auxiliary Amplifier jacks at rear of recorder and repeat Step 14. Follow procedures outlined in Steps 6, 9, and 10. Engage the Record mode and make a new recording over previous recording made in Step 12. Play back the new recording. All trace of the previous recording should be erased on the portion of the tape re-recorded. To erase the tape without recording new sound, remove recording signals from Input jacks at rear of recorder. Turn Right- and Left-Channel Volume controls to their extreme counterclockwise position (#1 position -

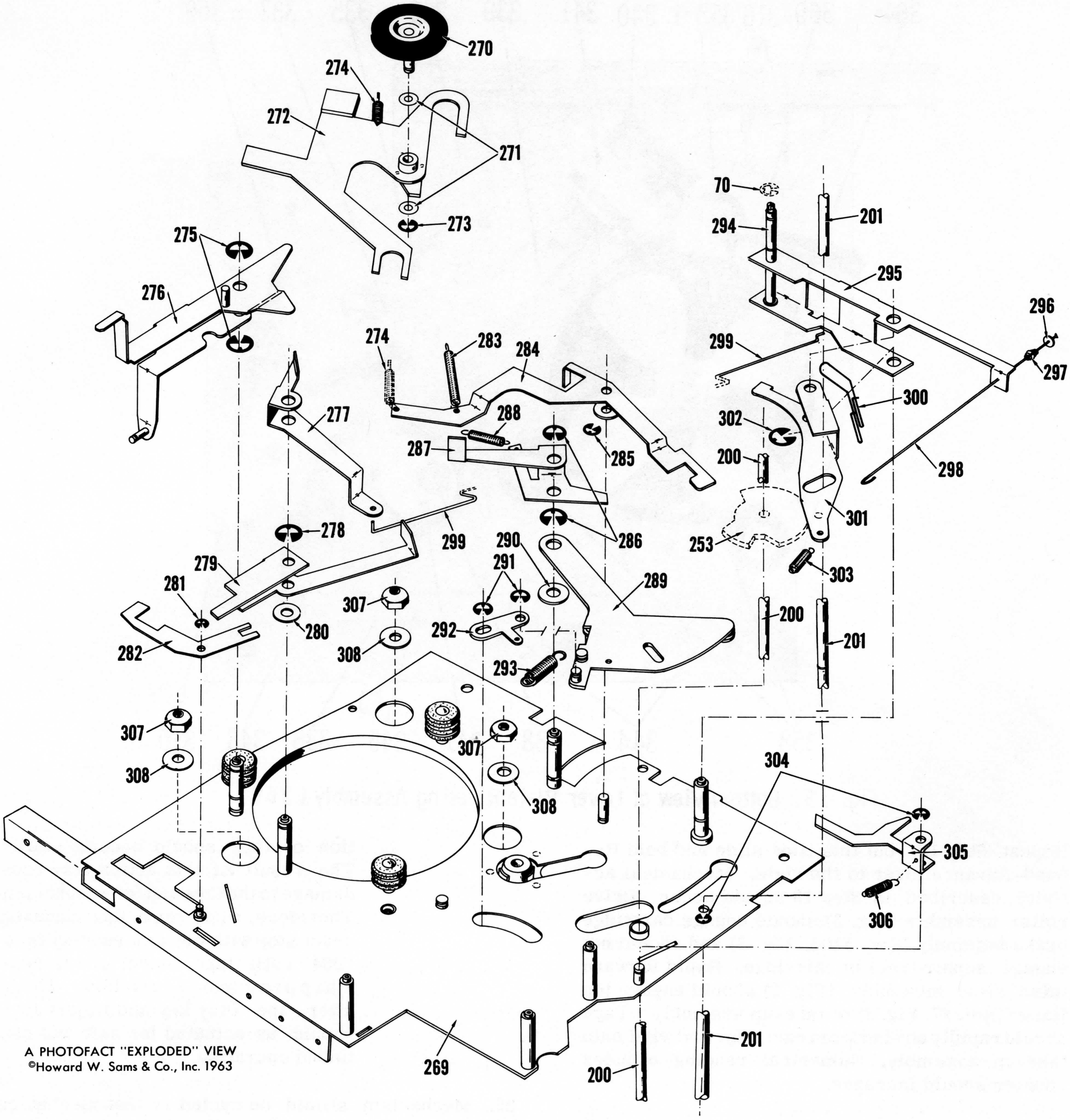

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Fig. 14. Exploded View — Top Side of Lower Plate Riveting Assembly (269).

do not turn to Off). Engage the Record mode. To check erasure of tape, manually rewind a portion of the tape. Then depress the Play key, turn up Volume controls, and play back portion of tape erased. There should be no sound reproduction.

Rewind-Advance Lever Operations

18. With the recorder engaged in the "Play & Record" mechanical function and with either the Play or Record key depressed, slide and hold Rewind-Advance lever to the left.

19. Play or Record key should release and tape loop forming arm assembly (Ref. #166, Fig. 3) should move tape away from heads. Take-up brake arm (Ref. #120, Fig. 3) should not engage top flange (Ref. #7, Fig. 3) of take-up assembly. Pressure roller (Ref. #132, Fig. 3) should disengage capstan-flywheel assembly (Ref. #266, Fig. 3).

20. Cartridge brake assembly (Ref. #103, Fig. 3) should disengage drive roller assembly. (Fig. 3). Rewind idler (Ref. #90, Fig. 3) should simultaneously engage motor drive pulley (Ref. #108, Fig. 3) and drive roller. Drive roller should contact supply reel in cartridge. Tape should rapidly unwind from take-up assembly and wind into cartridge. Numerical reading of index counter should decrease.

21. Release Rewind-Advance lever. Lever should automatically return to its center or neutral position and brakes should be applied to bring tape to a smooth stop.

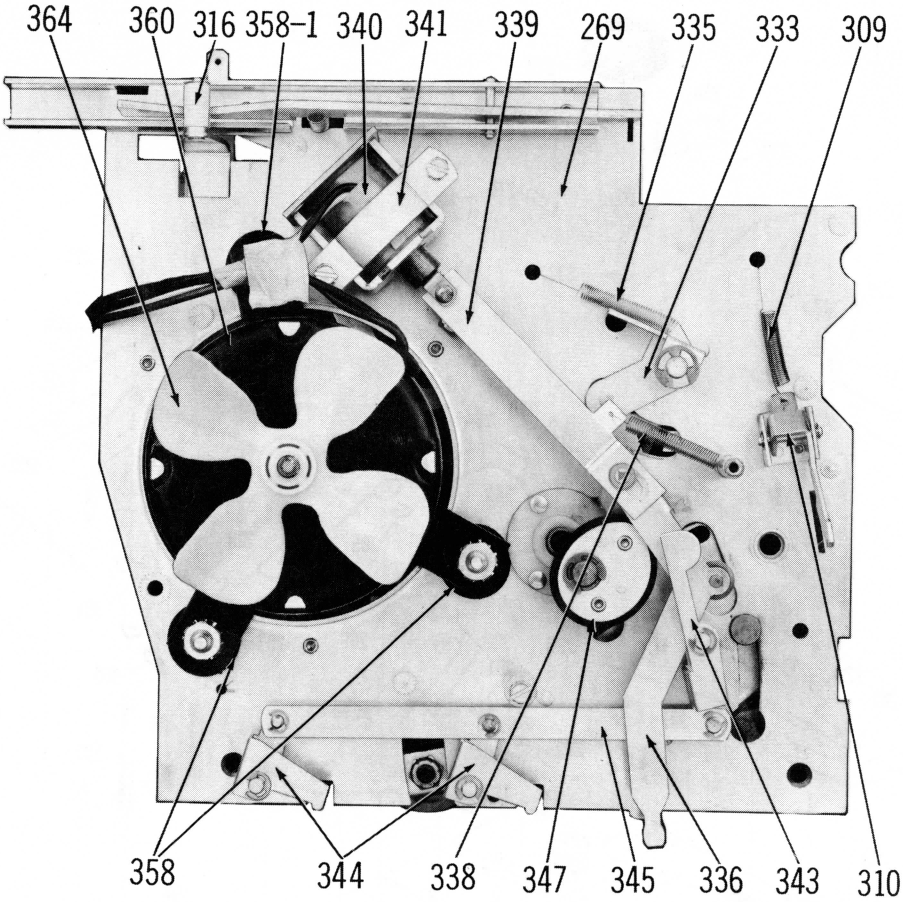


Fig. 15. Bottom View of Lower Plate Riveting Assembly (269).

22. Repeat Step 18; but this time slide and hold Rewind-Advance lever to the right. Mechanical activity described in Step 19 should occur. Drive roller assembly (Fig. 3) should engage cartridge brake assembly (Ref. #103, Fig. 3) and should not engage supply reel in cartridge. Rapid forward idler slide assembly (Fig. 3) should engage top flange (Ref. #7, Fig. 3) of take-up assembly. Tape should rapidly unwind from cartridge and wind onto take-up assembly. Numerical reading of index counter should increase.

23. Release Rewind-Advance lever. Mechanical activity described in Step 21 should occur.

Manual Rejection of Cartridge

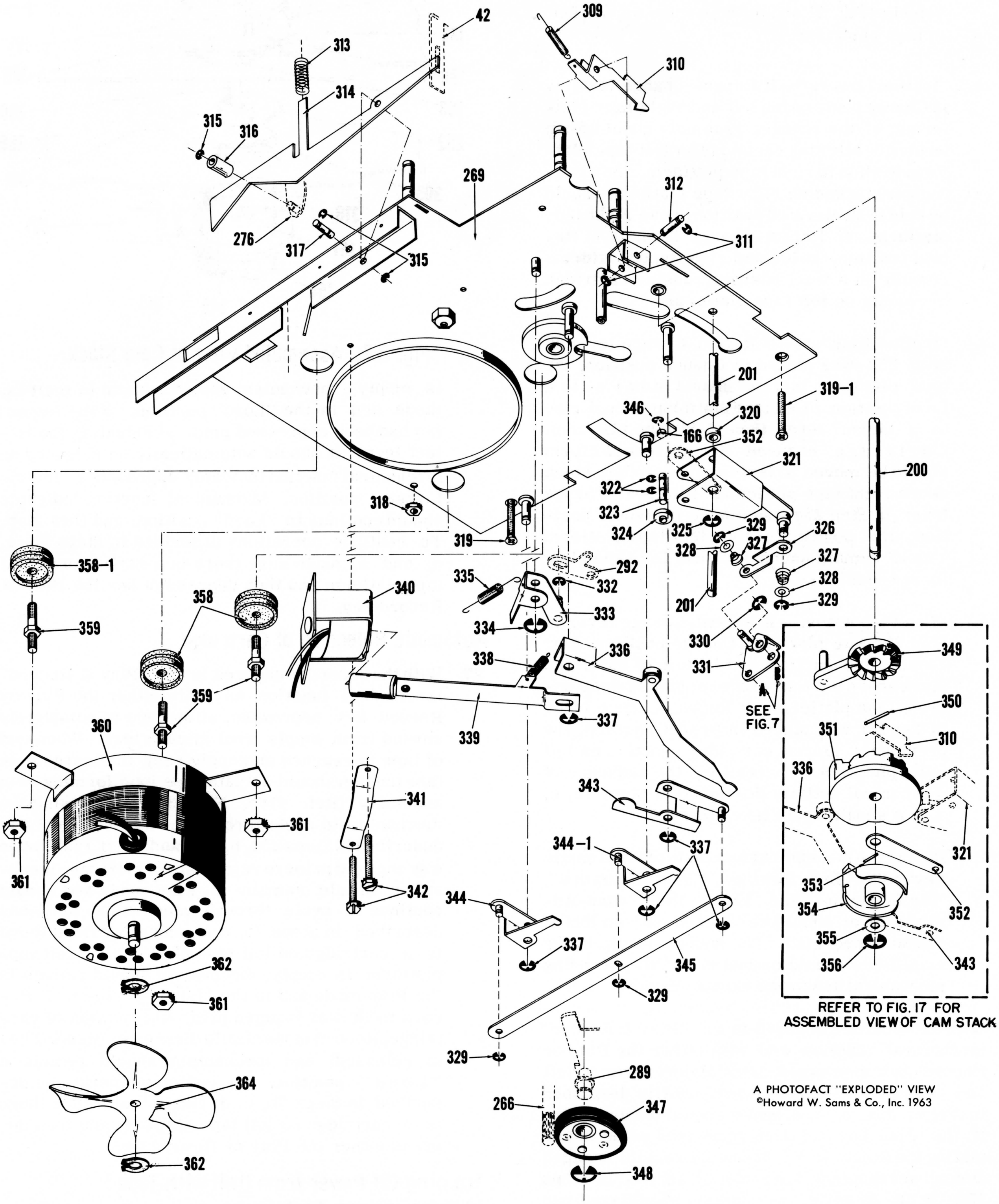
24. With the recorder engaged in the "Play & Record" mechanical function, manually rewind tape and note index counter reading while rewinding. Stop manual rewind of tape at a counter reading of "004" or above. If manual rewind of tape is stopped at a counter reading below "004", continue rewinding until tape leader end is heard whipping inside of cartridge (tape and leader completely rewound into cartridge). Depress Play key. Slide Reject lever to left and release.

CAUTION: If rewind of tape is stopped at a counter reading below "004" and the white tape leader end is not fully rewound into cartridge, a subsequent engagement of the Play key and Reject lever should cause the mechanism to cycle to the "Automatic Rewind" position—but motion of tape should become stalled. The result of this action may cause damage to the tape and/or mechanism. Therefore, when rewinding manually never stop with counter reading below "004" until tape leader end is heard whipping inside cartridge. Thereafter, the Play key and Reject lever should be actuated for safe and continued operation.

25. Mechanism should be cycled so that mechanical function indicated through window in top cover panel progresses from "Play & Record" position through positions of "Automatic Rewind", "End Rewind", "Incline Lowers", and "Incline Raises" before it returns to the "Load" position. During the preceding mechanical functions, the following mechanical acitvity should have occurred:

    a. "Automatic Rewind" position — Cartridge brake assembly (Ref. #103, Fig. 3) should disengage drive roller assembly (Fig. 3). Rewind idler (Ref. #90, Fig. 3) should simultaneously engage motor drive pulley (Ref. # 108, Fig. 3) and drive roller. Drive roller should contact supply reel in cartridge. Tape should rapidly unwind from take-up assembly and wind into cartridge. Index counter reading should automatically return to "000."

    NOTE: If manual rewind of tape in Step 24 was stopped at a counter reading of "004" or above, tape will continue rewinding until it has been completely wound into car-



REFER TO FIG. 17 FOR ASSEMBLED VIEW OF CAM STACK

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Fig. 16. Exploded View — Bottom Side of Lower Plate Riveting Assembly (269).

tridge before mechanism cycles to "End Rewind" position. If tape in Step 24 was completely rewound into cartridge manually, there should only be a momentary rewind action between the drive roller and supply reel in cartridge before mechanism cycles to "End Rewind" position. tion.

b. "End Rewind" position — Drive roller assembly (Fig. 3) should disengage supply reel in tape cartridge.

c. "Incline Lowers"— If Repeat-Change lever is in Change position the left and right tape platforms of the changer assembly should form an incline allowing cartridge on left tape platform to slide to right tape platform. Any cartridges stacked on right tape platform should be held in an elevated position above right tape platform. If Repeat-Change lever is in Repeat position, the left and right tape platforms remain in a level position causing cartridge to remain on left tape platform.

d. "Incline Raises"— If Repeat-Change lever in Step 25c was placed in Change position, the tape platform incline should now rise to a level position. Left tape platform should rise to a higher level than right tape platform. Cartridge changed to right tape platform should be moved to bottom of cartridge stack above right tape platform. If Repeat-Change lever in Step 25c was placed in Repeat position, the position of the right tape platform should remain unchanged, and left tape platform should rise.

e. "Load" position — If Repeat-Change lever in Step 25c was placed in Change position, next consecutive cartridge at bottom of cartridge stack above left tape platform should drop onto left tape platform. If Repeat-Change lever in Step 25c was placed in Repeat position, the previously played cartridge remains on left tape platform. Thereafter, the sequence of mechanical activity described in Steps 7b, c, d, & e should again take place.

NOTE: During the mechanical functions of "Automatic Rewind", "End Rewind", "Incline Lowers", "Incline Raises" and "Load", the Rewind-Advance lever should be "locked out" so that it cannot be operated. The audio circuits in the amplifiers should be muted for all preceding mechanical functions except "Load".

26. With the recorder engaged in the "Play & Record" mechanical function and with either the Play or Record key depressed, slide Reject lever to left and release. The mechanical activity described in Steps 25a, b, c, d, and e should occur again. If the Play key had been depressed prior to actuating the Reject lever, it should remain engaged during mechanical functions described in Steps 25a, b, c, d, and e; mechanism should continue to cycle through mechanical functions described in Steps 7b, c, d, and e provided there is a cartridge on left tape platform. If left tape platform is empty, mechanism should remain in the Play mode and in the "Load" position. If the Record key had been depressed prior to actuating the Reject lever, it should automatically be released as mechanical function indicator approaches "Incline Lowers" position. Mechanical function indicator should continue to "Load" position, and then stop. To continue operations described in Steps 7b, c, d, and e, make sure there is a cartridge on left tape platform and then depress either the Play or Record key.

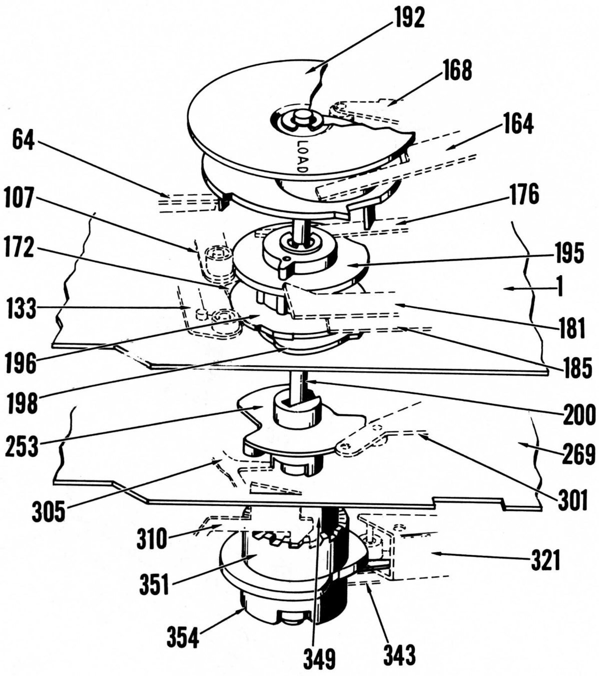


Fig. 17. Assembled View of Cam Stack.

Automatic Rejection of Cartridge

27. With the recorder engaged in the "Play & Record" mechanical function and with either the Play or Record key depressed, allow tape to completely unwind from supply reel in cartridge. When end of tape is reached on supply reel, the increase in tape tension should actuate tape loop forming arm assembly (Ref. #166, Fig. 3), thus causing the mechanism to cycle through mechanical functions described in Steps 25a, b, c, d, and e. If Play mode was engaged prior to rejection of cartridge, mechanism should remain in Play mode and should continue to cycle through mechanical functions described in Steps 7b, c, d, and e provided there is a cartridge on left tape platform. If left tape platform is empty, mechanism should remain in the Play mode and in the "Load" position. If Record mode was engaged prior to rejection of cartridge, Record mode should disengage (Record key is released) and mechanism should remain in "Load" position. To continue operations described in Steps 7b, c, d, and e, make sure there is a cartridge on left tape platform and then depress either the Play or Record key.

Turning Off Power from Unit with Tape Withdrawn from Cartridge

28. With the recorder engaged in the "Play & Record" mechanical function and with either the Play or Re-

cord key depressed, depress Stop key. Tape movement should stop. Depress On-Off key. Power should be removed from unit.

29a. Early Production Models (Below Serial #3643)
With the recorder engaged in the "Play & Record" mechanical function and with either the Play or Record key depressed, slide Reject lever to left and release; then depress Stop key and On-Off key. Mechanism should cycle through mechanical functions described in Steps 25a, b, c, d, and e. Power should automatically be removed from unit when "Load" position is reached.

29b. Late Production Models (Serial #3643 and Above)
Operation remains the same as in Step 29a provided a cartridge remains on left tape platform. However, if left tape platform is empty, it is not necessary to depress the On-Off key to remove power from the unit; after mechanism cycles through mechanical functions described in Steps 25a, b, c, d, and e, power should automatically be removed from unit when "Load" position is reached.

NOTES: 1. If Stop and/or On-Off keys are depressed while mechanism is cycling through "Cartridge Lowers", "Automatic Thread", and "Tape Sensing" positions, mechanical operations should continue until "Play & Record" position is reached.

If only the Stop key had been previously depressed, mechanism should remain idle in the "Play & Record" function, but power to the unit should remain on. If both Stop and On-Off keys had been previously depressed, mechanism should remain idle in the "Play & Record" function, and power to the unit should shut off also.

2. Early Production Models (Below Serial #3643) — If Stop and/or On-Off keys are depressed while mechanism is cycling through "Automatic Rewind", "End Rewind", "Incline Lowers", and "Incline Raises" positions, mechanical operations should continue until "Load" position is reached. If only the Stop key had been previously depressed, mechanism should remain idle in the "Load" function, but power to the unit should remain on. If both Stop and On-Off keys had been previously depressed, mechanism should remain idle in the "Load" function and power to the unit should shut off also.

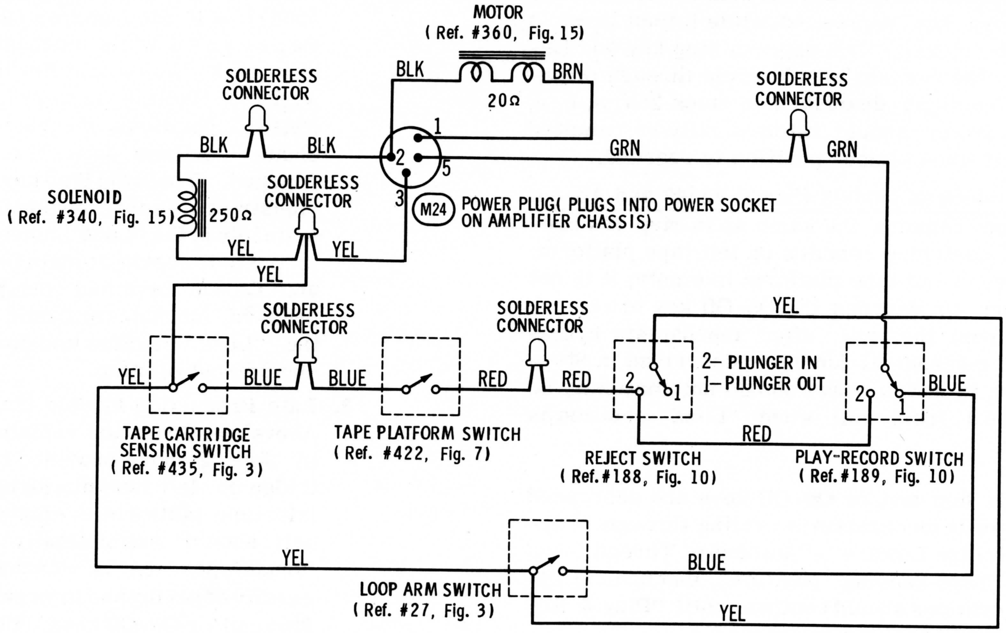
3. Late Production Models (Serial #3643 and Above) — Operation remains the same as in Note 2 above provided there is a cartridge on left tape platform. However, if left tape platform is empty, power to the unit should automatically shut off when "Load" position is reached without necessity of having had to previously depress Stop and/or On-Off keys. Under these conditions, since Stop key does not have to be actuated, Play key (if previously depressed) will remain in the engaged position as power shuts off in the "Load" position.

OPERATING LEGEND OF SWITCHES ASSOCIATED WITH MECHANICAL CYCLING OF MASTER MECHANISM (REFER TO FIG. 18)

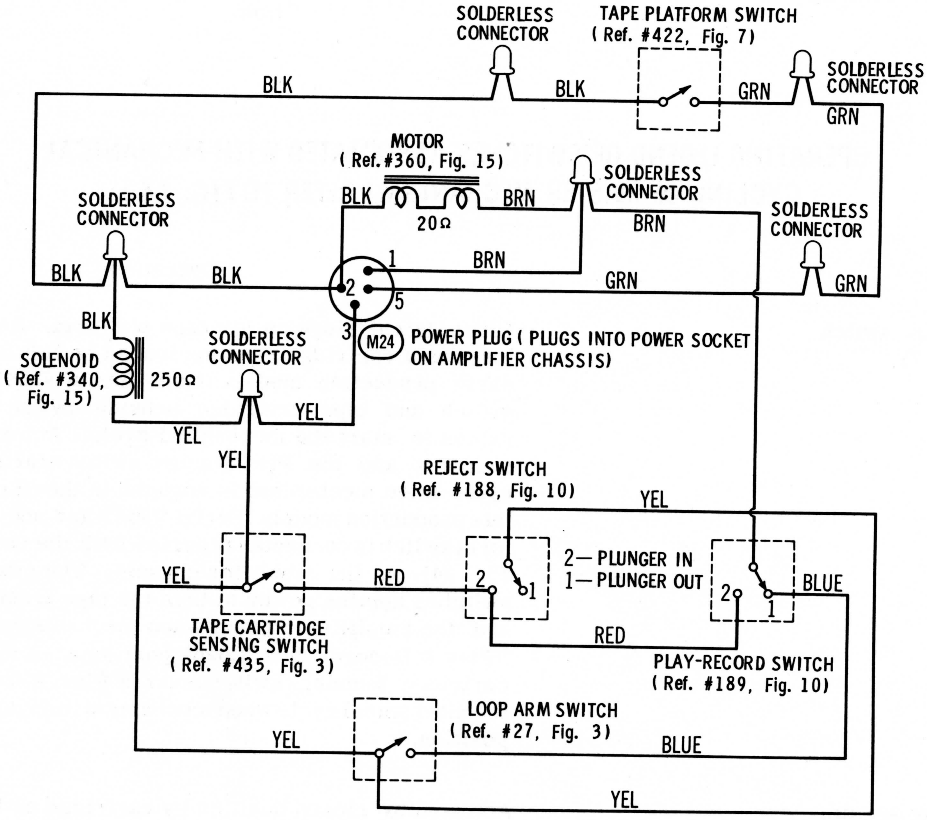
Switch:	Operation:
Tape platform switch (Ref. #422, Fig. 7)	Closed by cartridge on left tape platform. Remains closed as long as a cartridge remains loaded on left tape platform. In early production models (below Serial #3643), tape platform switch and tape cartridge sensing switch are connected in series to start the mechanical cycle. Actuation of these two switches and the Play-Record switch starts the mechanical cycle when mechanism is engaged in the "Load" position. In late production models (Serial #3643 and above) the tape platform switch is connected in series with the On-Off switch (M6, Fig. 24) on the amplifier chassis. The closing of these two switches applies power to both the tape transport mechanism and the amplifier chassis when mechanism is engaged in the "Play & Record" and "Load" positions. Actuation of the tape cartridge sensing switch and the Play-Record switch starts the mechanical cycle when mechanism is engaged in the "Load" position.
Tape cartridge sensing switch (Ref. #435, Fig. 3)	Actuated to closed position by cartridge on left tape platform. Closed in "Load" position but opens in "Cartridge Lowers" position of mechanism. Switch remains open until "Load" position of mechanism is reached again. Switch continues to close in "Load" position as long as a cartridge remains loaded on left tape platform.

NOTE: ALL SWITCHES ARE SHOWN IN "NORMALLY OPEN" POSITION
"NORMALLY OPEN" CONDITIONS:

1. MECHANISM ENGAGED IN "LOAD" FUNCTION.
2. LEFT TAPE PLATFORM EMPTY.
3. ALL KEYS ARE IN "UP" POSITION.



A. WIRING DIAGRAM FOR EARLY PRODUCTION MODELS
(BELOW SERIAL #3643)



B. WIRING DIAGRAM FOR LATE PRODUCTION MODELS
(SERIAL #3643 & ABOVE)

Fig. 18. Wiring Diagram — Master Mechanism.

Switch:	Operation:
Loop arm switch (Ref. #27, Fig. 3)	Opened in "Load", "Cartridge Lowers", "Automatic Thread", "End Rewind", "Incline Lowers", and "Incline Raises" positions of mechanism. Closed in "Tape Sensing" position. Closed in "Play & Record" position if Play or Record key is depressed. Opened in "Play & Record" position if Stop or Rewind — Advance lever is actuated. Closed in "Automatic Rewind" position if cartridge is rejected after complete manual rewind of tape into cartridge (complete manual rewind of tape into cartridge required if index counter reads below "004"). Switch is held open by left sensing jaw (Ref. #222, Fig. 3) in "Automatic Rewind" position if cartridge is rejected anytime index counter reads "004" or above; however, when end of tape rewind is reached, switch is actuated to closed position.
Reject switch (Ref. #188, Fig. 10)	Single Pole, Double Throw Switch — Can either be manually or automatically thrown to reject cartridge in "Play & Record" position of mechanism: Manual actuation of Reject lever throws switch (plunger in) to reject cartridge during Play or Record mode; switch is automatically thrown (plunger in) to reject cartridge when end of tape is reached in Play or Record mode.
Play-record switch (Ref. #189, Fig. 10)	Single Pole, Double Throw Switch — Switch is thrown (plunger in) by depressing Play or Record key in "Load" position of mechanism. Remains thrown (plunger in) in "Cartridge Lowers", "Automatic Thread", "Play & Record", "End Rewind", and "Incline Raises" positions of mechanism. Cam (Ref. #196, Fig. 17) throws switch (plunger out) in "Tape Sensing", "Automatic Rewind", and "Incline Lowers" positions of mechanism. After cartridge rejection, cam assembly (Ref. #192, Fig. 17) throws switch (plunger out) if Record key was previously depressed in "Load" position to mechanism; however, if Play key was previously depressed, switch is kept thrown to "plunger in" position. With Play or Record key depressed in "Play & Record" position of mechanism, depressing Stop key or actuating Rewind-Advance lever throws switch to "plunger out" position. When mechanism is engaged in any transient mode of operation (any function other than "Load" or "Play & Record") depressing Stop key causes switch to be thrown to "plunger out" position whenever mechanism cycles to "Load" or "Play & Record" position.

REPLACING SOUND HEADS

Make sure that all possible sources of trouble associated with the Play and Record functions of the recorder have been eliminated before replacing the heads. Check for following:

1. Heads (Ref. #'s 218 & 245, Fig. 3) may be dirty. Clean heads with a pipe cleaner soaked in alcohol.
2. Make sure that tape presses against heads when "Play & Record" mechanical function is engaged.
3. Loose socket connection (Fig. 19) on erase and/or play-record head.
4. Loose head cable plug (M20, Fig. 3) connection on amplifier.
5. Trouble in amplifier.

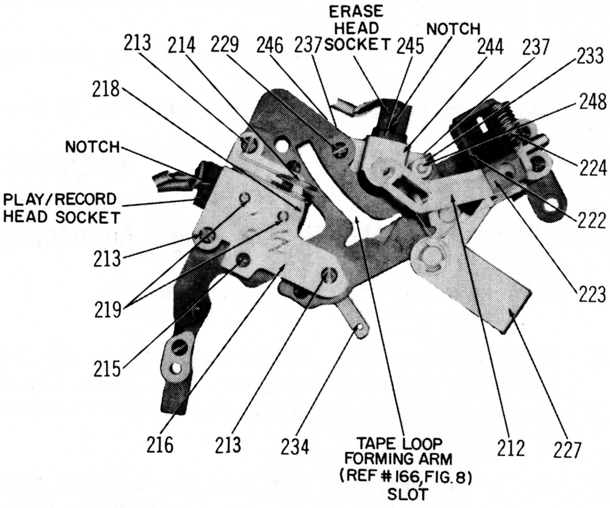


Fig. 19. Tape and Sensing Unit Assembly.

Removal of Tape and Sensing Unit Assembly (Fig. 19)

Should it become necessary to replace both play/record and erase heads, or only the erase head, remove the entire tape and sensing unit assembly from the master mechanism as follows:

1. Perform Steps 1 and 2 of "Case Disassembly" under "DISASSEMBLY INSTRUCTIONS". Remove right speaker plug and head plug (M20, Fig. 3) from amplifier chassis.

2. Turn unit over on its left side. Remove left speaker plug and 4-prong power plug (M24, Fig. 4) from amplifier chassis. Remove 4 screws (Ref. #24, Fig. 2) from front casting (Ref. #25, Fig. 2). Remove 4 amplifier mounting screws (Fig. 4) from beneath amplifier chassis. Remove amplifier chassis intact with right side casting (Ref. #40, Fig. 4).

3. After removing amplifier chassis, remove "E" ring (Ref. #346, Fig. 5) from tape loop forming arm assembly (Ref. #166, Fig. 3) at bottom of lower plate riveting assembly (Ref. #269, Fig. 5).

4. Refer to Fig. 3 and proceed as follows: Remove springs (138, 155, & 204). Remove "E" rings (156 & 159). Lift loop arm link (157) from tape loop forming arm assembly (166) and pivot link clockwise to clear tape and sensing unit assembly. Lift and remove tape loop forming arm assembly.

5. Refer to Fig. 3 and proceed as follows: Remove "E" ring (210) and washer (211). Remove screws (203 & 202). Remove screw (209). Remove circular self-locking retainer ring (69). Loosen right-hand screw (24) from loop arm switch shield (25) and remove interconnecting wire strap. Guide head cable and plug assembly clear of restraining parts, and carefully remove tape and sensing unit assembly (Fig. 19) from master mechanism.

To Replace Play Record Head (Refer to Fig. 19)

If only the play/record head needs replacing, it is not necessary to remove the entire tape and sensing unit from the master mechanism. The head assembly may be separately removed from tape and sensing unit with a minimum amount of disassembly as follows:

1. Unlatch top cover panel of unit and swing panel up.

2. Loosen right-hand screw (Ref. #24, Fig. 3) from loop arm switch shield (Ref. #25, Fig. 3) and remove interconnecting wire or ground strap.

3. Disconnect play/record head socket. Remove 3 screws (213) from head mounting plate (216). Lift and remove play/record head and mounting plate assembly.

4. To install the replacement head assembly, reverse procedures in Steps 2 and 3 above. When reconnecting head socket, orient notched side of socket at top.

NOTE: Play/record head (218), head mounting plate (216), azimuth adjust spring (214), azimuth adjust screw (215), and height adjust screws (219) are preassembled at the factory to form a composite replacement head assembly. Factory adjustment of head height screws (219) is preset with respect to head mounting plate (216) so that no further adjustment of head height is required after installation of the replacement head assembly. To insure optimum performance after installing the replacement head, align play/record head azimuth as outlined under "ELECTRICAL ADJUSTMENTS".

To Replace Erase Head (Refer to Fig. 19)

If erase head needs replacing, follow procedures outlined under "Removal of Tape and Sensing Unit Assembly" and then remove original erase head (245) as follows:

1. Disconnect erase head socket. Remove hex nut (233). NOTE: Some units also use hex nut (246). If hex nut (246) is used, remove it also. Then remove screw (229), mounting stud (248), and 2 tape guide spacers (237). Remove erase head assembly.

2. To install the replacement head assembly, reverse procedures in Step 1 above. When reconnecting head socket, orient notched side of socket at top.

NOTE: Erase head (245) and erase head bracket (244) are preassembled at factory to form a composite replacement head assembly. Factory adjustments of height and azimuth are preset with respect to erase head bracket (244) so that no further adjustments of the erase head are required after installing the replacement head.

MECHANICAL ADJUSTMENTS

Drive Roller Assembly (Fig. 3) Height Adjustment

1. Remove power and cartridges from unit.

2. Depress Play Key. Manually turn the top cam (mechanical function indicator; Ref. #192, Fig. 3) clockwise to the first "Automatic Thread" position.

3. Use a screwdriver and turn drive roller shaft (Ref. #294, Fig. 3) to obtain a 17/32" to 9/16" dimension between left tape platform surface and top surface of cartridge drive roller.

Drive Roller Assembly Axis Adjustment

To eliminate tape cartridge bounce on left tape platform when mechanism is engaged in manual rewind or "Automatic Rewind" function, proceed as follows:

1. Place a tape cartridge on left tape platform. Apply power to unit, depress Play key, and allow mechanism to cycle to "Play & Record" mechanical function. Thereafter, slide Rewind-Advance lever to Advance position and wind a portion of tape onto takeup assembly (Fig. 3). Return Rewind-Advance lever to its neutral position.

2. Insert a hollow-shaft tool (of proper size) over drive roller shaft (Ref. #249, Fig. 3) and apply slight bending force to right on tool. After bending shaft to right, slide Rewind-Advance lever to Rewind position and check to see if cartridge bounce is eliminated. If cartridge still bounces, continue to make bends on shaft. After each bend check for elimination of cartridge bounce in manual rewind until proper adjustment is obtained.

Take-Up Assembly (Fig. 3) Height Adjustment

1. Remove cartridges from unit and apply power.

   NOTE: After removing cartridges from left tape platform in late production models (Serial #3643 and above), it is necessary to keep tape platform switch closed in order to turn the unit on. Therefore, use a piece of 3M masking tape and tape switch down in the closed position.

2. With mechanism engaged in "Load" mechanical function, depress Play key.

3. If bottom flange (Ref. #22, Fig. 9) of take-up assembly is heard rubbing on take-up assembly guide ring (Ref. #20, Fig. 3), use a screwdriver and turn take-up assembly shaft (Ref. #19, Fig. 3) clockwise to point where rubbing stops. Then turn shaft additional 1/4 turn clockwise for correct adjustment tolerance.

4. To check for correct height adjustment when no rubbing of parts is heard, turn shaft counterclockwise to point where rubbing starts. Then turn shaft clockwise to point where rubbing disappears. Thereafter, turn shaft additional 1/4 turn clockwise for correct adjustment tolerance.

5. It is recommended that a final check for correct take-up assembly height be made as follows:

   a. Place a tape cartridge (having uniform width throughout narrow section of tape leader) on left tape platform.

   NOTE: 3M Revere cartridges have been manufactured with two differently constructed versions of tape leader attached to the tape. The earlier manufactured version has a uniform width throughout the narrow section of the tape leader. The later manufactured version has a tapered width throughout the narrow section of tape leader. Proper adjustment of take-up assembly height should be checked with the earlier manufactured tape cartridge.

   b. As mechanism cycles from second "Automatic Thread" position, check action of tape loop forming arm (Ref. #166, Fig. 3) to see that it slightly pivots to the left. As mechanism cycles to "Tape Sensing" position, if tape leader has passed tape loop forming arm should pivot to the extreme left, thus closing loop arm switch (Ref. #27, Fig. 3). This action should cause mechanism to continue cycling to "Play & Record" position. In "Play & Record" position, tape should smoothly unwind from cartridge and wind onto takeup assembly at playing speed without spilling, tangling, or twisting.

Left Sensing Jaw (Ref. #222, Fig. 3) Clearance Adjustment

1. Remove power and cartridges from unit.

2. Depress Play key. Manually turn the top cam (mechanical function indicator; Ref. #192, Fig. 3) clockwise to an intervening position between "Play & Record" and "Automatic Rewind".

3. Press down on top of right sensing jaw (Ref. #223, Fig. 3) with finger and tilt the jaw to the right. Pivot sensing jaw latch (Ref. #227, Fig. 19) to the right and slide right jaw toward the heads. Measure clearance between left jaw and the latch on tape loop forming arm (Ref. #166, Fig. 3). Clearance measurement should read from .010" to .025". Use a pair of long-nosed pliers and laterally bend left jaw until proper clearance measurement is obtained.

Loop Arm (Ref. #27. Fig. 3) Adjustment

NOTE: This adjustment procedure pertains to early production units which incorporate the early manufactured versions of loop arm switch and tape loop forming arm (Ref. #166, Fig. 3). Late model production units incorporate revisions in the design of loop arm switch and tape loop forming arm, thus eliminating the need of this adjustment.

When Stop key is slowly or hesitantly depressed (depressed without positive action) to release a previous engagement of the Play or Record key, mechanism may be prematurely cycled to the "Automatic Rewind" function. The reason for this premature condition results from loop arm switch not opening before plunger of play-record switch (Ref. #189, Fig. 10) returns or opens to its release position. To remedy this situation, proceed as follows:

1. Use pair of long-nosed pliers and laterally bend wire form of loop arm switch away from contacting surface of tape loop forming arm.

CAUTION: Do not bend wire form to an extreme so that such bending prevents routine cycling of mechanism from "Tape Sensing" to "Play & Record" function.

2. If proper timing between loop arm switch and play-record switch is still not obtained after bending the wire form of loop arm switch, loosen switch bank mounting screw (Ref. #187, Fig. 10). Turn switch bank in clockwise direction to point where proper timing between switches is obtained, and then retighten mounting screw.

CAUTION: Do not turn switch bank to an extreme clockwise position. Check for extreme clockwise positioning of switch bank as follows: With mechanism engaged in "Load" function, place tape cartridge on left tape platform. Without sliding Record Lock button to the right, depress Record key. If play-record switch plunger is thrown (plunger depressed) to cause cycling of mechanism, switch bank is positioned too far clockwise. Reposition switch bank counterclockwise to a position that (a) achieves proper timing between loop arm switch and play-record switch and (b) prevents cycling of mechanism when Record key is depressed without sliding Record lock button to the right.

Drive Roller Assembly (Fig. 3) Braking Adjustment

This adjustment provides for proper braking action between cartridge drive roller and supply reel in cartridge when Rewind-Advance lever is returned to center position from a prevailing engagement of manual Advance.

Proceed as follows:

1. Place a tape cartridge on left tape platform, apply power to unit, depress Play key, and allow mechanism to cycle to "Play & Record" function.

2. Depress Stop key. Slowly slide Rewind-Advance lever to the right until lower rapid forward drive clutch (Ref. #38, Fig. 3) starts to spin against edge of motor drive pulley assembly (Ref. #108, Fig. 3). At this point, slight additional movement of Rewind-Advance lever to the right should retract cartridge drive roller from supply reel in cartridge.

3. If an excessive amount of right-hand movement is required to retract cartridge drive roller from supply reel in cartridge, make following adjustment in Step 4.

4. Use pair of long-nosed pliers and laterally bend the end of feed roller release arm (Ref. #277, Fig. 13) to the left; bend end of arm where rapid forward wire form (Ref. #299, Fig. 13) is hooked. Bending of the arm effectively shortens wire form (299) so that proper timing relationship can be obtained between lower rapid forward drive clutch and the cartridge drive roller. Repeat adjustment until proper operation described in Step 2 is obtained.

5. To check adjustment, slowly slide Rewind-Advance lever from Advance position to center position several times. Each time, check for proper braking action as will be evidenced by no spilling of tape in cartridge.

Take-Up Brake Arm (Ref. #120, Fig. 3) Adjustment

This adjustment provides for proper braking action between the brake tire on take-up brake arm and the take-up top flange (Ref. #7, Fig. 3) when Rewind-Advance lever is manually actuated from center position to Advance position. Proceed as follows:

1. Place a tape cartridge on left tape platform, apply power to unit, depress Play key, and allow mechanism to cycle to "Play & Record" function.

2. Depress Stop key. Slowly slide Rewind-Advance lever to the left until drive roller (Fig. 3) begins to turn against cartridge reel. At this point, the brake tire on take-up brake arm should not leave the edge of take-up flange until after the drive roller starts to turn the cartridge reel. If brake tire on take-up brake arm leaves edge of take-up top flange before drive roller starts to turn cartridge reel, make following adjustment in Step 3.

3. Remove power from unit. While holding Rewind-Advance lever to the right, bend or force (with hand) take-up brake arm toward edge of take-up top flange until proper timing relationship is obtained.

Record Key Return Arm (Ref. #64, Fig. 3) Adjustment

1. Remove cartridges and power from unit.

2. With mechanism engaged in "Load" function, slide Record Lock button to right and then depress Record key. Record key should stay latched down and there should be a slight play (up and down movement) of record key return arm. If these conditions do not exist, make following adjustment in Step 3.

3. With Record key disengaged, grasp the edges of record key return arm — just forward of the step that normally contacts the underside of record key arm (Ref. #61, Fig. 3) — between the jaws of a pair of pliers. Using roll pin (Ref. #43, Fig. 3) as a fulcrum point to bend against, apply downward bending force (in lever fashion) with pliers. Since the metal is "soft" to accommodate this adjustment, the bending force does not have to be overexerted. Check for proper adjustment as described in Step 2.

4. With Record key engaged, manually turn the top cam (mechanical function indicator; Ref. #192, Fig. 3) clockwise to position where lobe (large headed rivet) on underside of function indicator cam is ready to trip the record key return arm. If return arm is properly positioned, further clockwise rotation of the function indicator cam should trip the return arm and Record key should release. However, if the front (or formed end) of the return arm is positioned too low, proper tripping action will not occur and Record key will not be released. Therefore, in instances where the formed end of the return arm is positioned too low, make following adjustment in Step 5.

5. Turn function indicator cam to any position that will enable return arm to be bent upward without hitting cam lobe on underside of function indicator cam. Insert shaft of Phillips screwdriver under the "half rounded" formed end of the return arm. Using the key shaft (Ref. #45, Fig. 3) as a fulcrum point to bend against, apply downward pressure on screwdriver to position return arm so that proper tripping action is obtained.

Play Record Head (Ref. #28, Fig. 19) Adjustment

1. Head Height

Proper height of play/record head has been carefully adjusted at the factory. Therefore, no further adjustment should be required.

2. Head Azimuth

Play/record head azimuth has been correctly adjusted at the factory and should not require further attention unless head has been replaced. Therefore, should original head be replaced, use following procedure to align head azimuth.

a. Load a cartridge of special 12 kc azimuth alignment tape on left tape platform. NOTE: These tapes are available from 3M Revere.

b. Turn Tone controls to "Treble" position. Connect a VTVM to External Speaker jack or Auxiliary Amplifier jack of either left or right channel.

c. Turn unit on. Depress Play key and turn up Volume control of channel being measured until a mid-scale reading is obtained on meter. Very slowly adjust azimuth alignment screw (Ref. #215, Fig. 19) until a maximum peak reading is obtained — as indicated by meter deflection reaching a maximum before starting to decrease as screw is continuously turned in same direction. If meter reading deflects off-scale before a maximum peak can be reached, turn Volume control down until reading returns to mid-scale position. It is not necessary to repeat adjustment procedure for other channel since azimuth agreement between left and right channels is held to close tolerances.

NOTE: An approximate azimuth alignment can be made without special 12 kc tape by playing a commercial pre-recorded musical selection and adjusting alignment screw (Ref. #125, Fig. 19) for maximum treble tone while listening to playback with Tone controls in "Treble" position. Although this alternate method is not as accurate, it is quite satisfactory.

Erase Head (Ref. #245, Fig. 19) Adjustment

The erase head height has been properly adjusted at the factory and should not require further adjustment in the field. No adjustment is provided for erase head azimuth.

Erase Bias Adjustments (Refer to Fig. 4)

1. Erase Voltage

a. Remove all cartridges from unit. Remove bottom cover (Ref. #5, Fig. 2) of case. Refer to Step 1 of "Case Disassembly" instructions.

b. Turn unit on. Depress Record Key and turn on Volume control switches of both channels.

NOTE: After removing cartridges from left tape platform in late production models (Serial #3643 and above), it is necessary to keep tape platform switch closed in order to turn the unit on. Therefore, use a piece of 3M masking tape and tape switch down in the closed position.

c. Connect a VTVM (capable of accurately measuring voltage at 80kc) between pin 2 of 6C4 (V7) and chassis ground.

d. Adjust erase/bias oscillator coil (L3) core for VTVM reading of 55 volts rms.

2. Bias Voltage

After proper erase voltage adjustment has been made, adjust left-and right-channel record head bias as follows:

NOTE: A colored dot is painted adjacent to the left (lower) and right (upper) channel pole pieces of the play/record head. These two dots may or may not be the same color. When following the procedure for record head bias adjustment, make bias voltage measurements in accordance with following color code table:

COLOR	BIAS VOLTAGE (RMS)
White	21 Volts
Orange	26 Volts
Green	31 Volts
Red	36 Volts

a. Connect a VTVM (capable of accurately measuring voltage without loading circuit at 80kc) between pin 6 of head socket (M21) and chassis ground. Adjust left-channel bias trimmer (C37) to obtain bias voltage indicated in table above.

b. Move high side of VTVM to pin 2 of head socket (M21). Adjust right-channel bias trimmer (C38) to obtain bias voltage indicated in table above.

Hum Balancing Adjustments

Four access holes are provided in case bottom cover (Ref. #5, Fig. 2) for adjustment of hum controls R2, R3, R5, and R6 (See Fig. 4). An instruction label on bottom cover identifies the access holes for the channel to which the hum control adjustments apply. Remove all cartridges from unit and adjust hum controls with a small-bladed screwdriver as follows:

1. Turn unit on and allow warmup. Depress Play key.

NOTE: After removing cartridges from left tape platform in late production models (Serial #3643 and above), it is necessary to keep tape platform switch closed in order to turn the unit on. Therefore, use a piece of 3M masking tape and tape switch down in the closed position.

2. Place both Tone controls in "Hi-Fi" position. Turn left-channel volume control to maximum position and right-channel volume control to minimum (or "Off") position. To lower hum, first try reversing the power plug in AC outlet. Use plug position which gives lowest hum level.

3. Alternately adjust first hum (R3) and second hum (R2) controls for minimum hum level from left-channel speaker.

4. Turn left-channel Volume control to minimum (or "Off") position and right-channel Volume control to maximum position. Alternately adjust third hum (R6) and fourth hum (R5) controls for minimum hum level from right-channel speaker.

NOTE: It may be necessary to alternately adjust the controls for each channel several times before proper settings are obtained.

MECHANICAL TROUBLES

The following list pertains to possible troubles which may affect the operation of the master mechanism assembly. For troubles which may affect circuit functions of the amplifier chassis, refer to section on "ELECTRICAL TROUBLES."

1. Left Tape Platform Does Not Lower (Early Production Models — Below Serial #3643)

1. Faulty tape cartridge sensing switch (Ref. # 435, Fig. 3) and/or tape platform switch (Ref. #422, Fig. 7).

   a. Check continuity of switches with ohmmeter or test light. If tape cartridge sensing switch is defective, remove 2 screws (Ref. #436, Fig. 7) and replace switch. If tape platform switch needs replacing, it is necessary to remove and disassemble the changer assembly (Figs. 6 & 7) in order to gain access to the switch. Refer to "Master Mechanism Disassembly" under "DISASSEMBLY INSTRUCTIONS."

NOTE: In late production models (Serial #3643 and above) the tape platform switch (Ref. #422, Fig. 7) is no longer used in the circuit which controls the start of the mechanism cycle, but rather it is now used as an on-off switch which controls the application of power to the entire unit when mechanism is engaged in the "Load" and "Play & Record" functions. Therefore, a faulty tape platform switch would not cause the left tape platform not to lower (provided power is being applied to the unit). Unit would be completely dead if tape platform switch is open.

2. Left Tape Platform Lowers, but Cartridge Hangs Up

1. Improper withdrawl of load pawls (Ref. #'s 368, 370, & 387, Fig. 7).

   a. Check for bent or deformed parts (Ref. #'s 343, 344, & 345, Fig. 5) on underside of lower plate riveting assembly (Ref. #269, Fig. 5). Check for missing "E" rings (Ref. #'s 329 & 337, Fig. 16) associated with parts (Ref. #'s 343, 344, & 345).

   b. Check to see that cam arm (Ref. #343, Fig. 5) is properly actuated by cam (Ref. #354, Fig. 5).

3. Left Tape Platform Lowers and Back of Cartridge Drops, but Front of Cartridge Hangs Up

1. Feed roller arm tension spring (Ref. #300, Fig. 13) is too weak to sufficiently pull back the feed roller arm assembly (Ref. #295, Fig. 13).

   a. Hold back jaw opening toggle arm assembly (Ref. #164, Fig. 3) to allow access to spring (300), and bend spring to increase tension.

NOTE: Another bend further to left on spring may be necessary if first bend causes the spring to strike left stack pawl (Ref. #372, Fig. 6) when mechanical function indicator (Ref. #192, Fig. 3) is in the first "Automatic Thread" position.

   b. Replace spring (300).

4. Tape Leader Does Not Feed from Cartridge

1. Tight or otherwise faulty cartridge.

   a. Try several cartridges.

   b. Check "Drive Roller Assembly Height Adjustment" as outlined under "MECHANICAL ADJUSTMENTS."

2. Drive roller assembly (Fig. 3) too high or too low.

   a. Replace drive roller shaft (Ref. #294, Fig. 3) and make "Drive Roller Assembly Height Adjustment" as outlined under "MECHANICAL ADJUSTMENTS."

3. Slippage between cartridge drive roller assembly (Ref. #75, Fig. 9) and cartridge drive roller hub assembly (Ref. #78, Fig. 9).

   a. Replace drive roller assembly (75) and drive roller hub ass'y. (Ref. #78, Fig. 9).

4. Cartridge drive roller assembly (Ref. #75, Fig. 9) binding on drive roller shaft (Ref. #294, Fig. 3).

   a. Replace drive roller assembly (75) and shaft (294).

5. Feed-out drive belt (Ref. #84, Fig. 9) does not drive cartridge drive roller hub assembly (Ref. #78, Fig. 9).

   a. If rubber remnants are visible in the area drive belt is slipping on capstan pulley (Ref. #88, Fig. 9). Check for drag on cartridge drive roller pulley (Ref. #83, Fig. 3).

   b. Remove and replace drive belt (84).

5. Mechanical Function Indicator (Ref. #192, Fig. 3) Does Not Cycle From "Tape Sensing" to "Play & Record" Function

1. Wire form to loop arm switch (Ref. #27, Fig. 3) bent out of proper operating position.

   a. Bend wire form of switch (27) so that mechanism cycles properly. Make bend on wire form in lieu of procedure for "Loop Arm Switch Adjustment" under "MECHANICAL ADJUSTMENTS."

2. Defective switch (27).

   a. Replace switch. After replacing switch in early production units (below Serial #3643), make "Loop Arm Switch Adjustment" as outlined under "MECHANICAL ADJUSTMENTS."

3. End impulse knuckle assembly (Ref. #160, Fig. 8) doesn't "make."

   a. Check for binding of linkage among parts (Ref. #'s 157, 160, & 181, Fig. 8). Remove all burrs and straighten or replace all bent or deformed parts. Check to see that tape loop forming arm (Ref. #166, Fig. 3) pivots freely and does not bind in slot on tape and sensing unit assembly (Fig. 19).

   b. Replace tension springs (Ref. #'s 138 and 162, Fig. 8).

   c. If knuckle assembly (160) still doesn't "make" after performing Steps 3a & b, remove 1 to 5 turns from tension spring (Ref. #138, Fig. 8) and re-install spring.

6. Counter Does Not Work

1. Defective counter (Ref. #142, Fig. 8).

   a. Remove and replace counter.

2. Counter release arm (Ref. #143, Fig. 11) loose on shaft (Ref. #146, Fig. 9) or improperly positioned.

   a. Check shaft (146) for missing "E" rings (Ref. #145, Fig. 9). Check for proper positioning between counter release arm (143) and counter release actuator arm (Ref. #279, Fig. 13).

3. Tension spring (Ref. #144, Fig. 11) disconnected or missing.

   a. Reconnect or replace spring.

7. Mechanism Prematurely Cycles to "Automatic Rewind" Function When Stop Key is Depressed to Release Play or Record Key

1. Improper timing between loop arm switch (Ref. #27, Fig. 3) and play-record switch (Ref. #189, Fig. 10).

   a. Make "Loop Arm Switch Adjustment" as outlined under "MECHANICAL ADJUSTMENTS."

2. End impulse knuckle assembly (Ref. #160, Fig. 8) doesn't "break" easily enough and causes reject arm assembly (Ref. #181, Fig. 8) to actuate reject switch (Ref. #188, Fig. 10).

NOTE: Observe knuckle action when Stop key is depressed to release Play or Record key. If an impulse is noted in the reject arm (181), the knuckle is not "breaking" easily enough.

   a. Replace knuckle assembly (160).

   b. Replace tension spring (Ref. #162, Fig. 8) if it is deformed to the extent that excessive tension is being applied.

   c. Replace tension spring (Ref. #138, Fig. 8).

3. NOTE: If this complaint exists because knuckle assembly is being pulled excessively beyond straight and is buckling in reverse direction, replace existing knuckle with new issue knuckle.

8. Mechanism Prematurely Cycles to "Automatic Rewind" Function When Rewind-Advance Lever is Moved to Rewind Position

1. Search lever detent arm pivot pin (Ref. #317, Fig. 5) loose or missing.

   a. Re-install or refasten pivot pin (317).

2. Search lever detent arm roller (Ref. #316, Fig. 15) loose or missing.

   a. Re-install or refasten roller (316).

3. Stop key disengaging lever (Ref. #148, Fig. 9) loose or missing.

   a. Re-install or refasten lever (148).

4. Drive roller assembly (Fig. 3) engages cartridge reel before Play or Record key disengages.

   a. Place an additional washer (.005" to .008" thick — Ref. #48, Fig. 9) beneath fiber washer (Ref. #47, Fig. 9) on key roller slide (Ref. #53, Fig. 9).

9. Rapid Advance Weak or Inoperative

1. Excessive end play in upper rapid forward drive clutch assembly (Ref. #36, Fig. 8).

a. Use additional spacing washers (Ref. #33, Fig. 9) under retaining ring (Ref. #32, Fig. 9).

2. Excessive wear of felt clutch rings on upper rapid forward drive clutch assembly (Ref. #36, Fig. 8).

   a. Replace felt or replace entire upper rapid forward drive clutch assembly (36). Test for adequate rapid forward speed with most of the tape from cartridge wound on the take-up assembly.

3. Film of grease or other substance on driving surfaces of motor drive pulley assembly (Ref. #108, Fig. 3), lower rapid forward drive clutch (Ref. #38, Fig. 8), upper rapid forward drive clutch assembly (Ref. #36, Fig. 8), or take-up top flange (Ref. #7, Fig. 8).

   a. Clean driving surfaces thoroughly with alcohol solvent.

4. Drive roller assembly (Fig. 3) misadjusted.

   a. Make "Drive Roller Assembly Braking Adjustment" as outlined under "MECHANICAL ADJUSTMENTS."

10. Cartridge Bounces or Rattles on Left Tape Platform in Manual Rewind or "Automatic Rewind" Function

1. Improper drive roller assembly (Fig. 3) axis adjustment.

   a. Make "Drive Roller Assembly Axis Adjustment" as outlined under "MECHANICAL ADJUSTMENTS."

11. Noisy Manual or Automatic Rewind

1. Improper drive roller assembly (Fig. 3) axis adjustment.

   a. Make "Drive Roller Assembly Axis Adjustment" as outlined under "MECHANICAL ADJUSTMENTS."

2. Broken or sloppy rewind idler slide assembly (Ref. #91, Fig. 11).

   a. Replace rewind idler slide assembly (91).

   b. Replace rewind idler assembly (Ref. #90, Fig. 8). Apply suitable grease on shaft.

12. Mechanism Fails to Cycle to "Automatic Rewind" Function at End of Cartridge

1. Mechanical function indicator (Ref. #192, Fig. 3) did not cycle to "Play & Record" function at end of "Tape Sensing" function.

   a. Refer to "Complaint #5" under "MECHANICAL TROUBLES."

2. Mechanical function indicator (192) correctly cycled to "Play & Record" position, but end impulse knuckle assembly (Ref. #160, Fig. 8) did not "make" properly after an interim operation of the Rewind-Advance lever.

   a. Refer to "Complaint #5", Parts 3a, b, and c, under "MECHANICAL TROUBLES."

3. Reject switch (Ref. #188, Fig. 10) defective or out of actuation range of reject arm assembly (Ref. #181, Fig. 8).

   a. Check switch (188) and replace if defective.

A b. Check reject arm (181) travel and, in lieu of procedure for "Loop Arm Switch Adjustment" under "MECHANICAL ADJUSTMENTS," re-orient switch (188) — if necessary — so that it is properly actuated by reject arm (181).

4. Pressure roller tension spring (Ref. #134, Fig. 9) is exceedingly stretched to cause the tension exerted by the pressure roller (Ref. #132, Fig. 3) against capstan (Ref. #266, Fig. 3) to be weakened so that nylon trailer on end of tape is not pulled taut.

   a. Replace spring (134).

   b. Clean bearing surface of pressure roller (132) with suitable solvent.

13. Mechanism Automatically Rewinds, but Cycles to "End Rewind" Position Before Tape has Completely Rewound Into Cartridge

1. Latch on tape loop forming arm assembly (Ref. #166, Fig. 3) failed to grasp left sensing jaw (Ref. #222, Fig. 3) as mechanism cycled from "Play & Record" position to "Automatic Rewind" position.

   a. Make "Left Sensing Jaw Clearance Adjustment" as outlined under "MECHANICAL ADJUSTMENTS." Reject several playing cartridges to check adjustment.

14. Cartridge Does Not Transfer to Right Tape Platform When Incline Lowers (Either Play or Record Key Previously Engaged in "Play & Record" Function)

1. Drive roller assembly (Fig. 3) is pressing cartridge against back wall of changer because vertical tab on front of key roller slide (Ref. #53, Fig. 8) lacked sufficient forward travel to engage roller slide latch (Ref. #53, Fig. 8) when Record key was previously depressed.

   a. Remove roller slide latch (53) and file .010" off edge of latch. (File latch at right angles to the long arm of the part). Reinstall roller slide latch and test for proper operation.

15. Cartridge Does Not Transfer to Right Tape Platform When Incline Lowers (Either Play or Record Key Previously Engaged in "Play & Record" Function)

1. Drive roller assembly (Fig. 3) doesn't retract far enough from cartridge.

a. Replace feed roller arm tension spring (Ref. #300, Fig. 13).

2. Tape platform switch (Ref. #422, Fig. 7) actuating button (Ref. #427, Fig. 3) is too high, thus causing drag on bottom of cartridge.

   a. File down the tip of the actuating button so that when button is fully depressed it is slightly lower than highest point of rollers (Ref. #426, Fig. 3) on platform. Test for proper operation.

16. Mechanism Makes Noise When Incline Raises

1. Motor fan (Ref. #364, Fig. 8) hits screen on bottom cover assembly (Ref. #5, Fig. 2) when maximum lateral load is placed on motor shaft.

   a. Fan (364) is too low on motor shaft or bottom retaining ring (Ref. #362, Fig. 16) is missing from end of motor shaft. Relocate fan and install retaining ring.

2. One or more of the rubber motor mounts (Ref. #'s 358 and 358-1, Fig. 15) have lost their resiliency and are allowing the motor to fall.

   a. Replace the heavier-type motor mount (358-1). If other two motor mounts (358) appear weak or otherwise damaged, it is recommended that they be replaced with the heavier-type mount (358-1).

3. When the noise heard is "rasping" and the incline raises jerkily, the tire on power cam assembly (Ref. #347, Fig. 15) is loose, worn, or slipping. The power cam stud on the power cam roller arm assembly (Ref. #289, Fig. 13) may be loose or bent as will be indicated by knurl marks on the steel edge of the power cam (347) while tire still appears in good condition.

   a. Install new power cam and tire assembly (347) and observe its action while changer mechanism is lifting a 20-cartridge load on right tape platform. If flywheel assembly (Ref. #266, Fig. 11) makes knurl marks on the steel edge of the power cam (347), check for a loose or bent stud or a possible drag on power cam roller arm assembly (289). Replace power cam roller arm assembly (289) if defective, or eliminate any obstructions which may be causing a drag.

   b. Check to see that step on end of changer table lifter slide link (Ref. #378, Fig. 7) does not catch in the slot on left changer wall assembly (Ref. #383, Fig. 7). If any interference seems possible, use a pair of pliers and bend top edge of lifter slide link (378) away from slot in left changer wall so as to eliminate future possibility of interference between these parts.

17. With Play Key Engaged, Mechanism Continually Cycles With Cartridge on Load Platform, Cycling Stops When Cartridge is Removed from Load Platform (Early Production Models Only —Below Serial #3643)

1. Tape cartridge sensing switch (Ref. #435, Fig. 3) is defective (switch remains closed).

   a. Replace switch (435).

2. Cartridge sensing arm (Ref. #432, Fig. 3) is binding in slot on left changer wall assembly (Ref. #383, Fig. 7) or is caught on end of torsion spring (Ref. #434, Fig. 6) or elsewhere.

   a. Restore free travel of cartridge sensing arm (432).

3. Up-and-down motion of tape cartridge sensing switch (Ref. #435, Fig. 3) retarded by wires or other obstructions.

   a. Clear wires or other obstructions to restore uninhibited travel of switch (435).

18. With Play Key Engaged and No Cartridge on Load Platform, Mechanism Continually Cycles from "Load" Function Thru "Play & Record" Function; Cycling Stops When "Automatic Rewind" Function is Reached (Early Production Models Only — Below Serial #3643)

1. Reject switch (Ref. #188, Fig. 10) is defective (switch remains closed).

   a. Replace switch (188). Position switch in lieu of procedure for "Loop Arm Switch Adjustment" under "MECHANICAL ADJUSTMENTS."

2. Reject switch (Ref. #188, Fig. 10) not positioned properly, or switch actuating tab is overbent on reject arm assembly (Ref. #181, Fig. 8).

   a. Reposition switch in lieu of procedure for "Loop Arm Switch Adjustment" under "MECHANICAL ADJUSTMENTS." Test for proper operation.

   b. Straighten actuating tab, or replace reject arm assembly (181).

19. Mechanism Cycles Continually With or Without Cartridge on Load Platform, and With or Without Engagement of Play Key (Early Production Models Only — Below Serial #3643)

1. Tension spring (Ref. #335, Fig. 15) missing or disconnected from hole in solenoid cam and cycle release arm assembly (Ref. #333, Fig. 15).

   a. Replace or reconnect tension spring (335).

2. Solenoid cam and cycle release arm assembly (Ref. #333, Fig. 15) drags on underside of lower plate riveting assembly (Ref. #269, Fig. 15) or is otherwise prevented from fully traversing its normal travel arc.

   a. Push downward on top of the stud which is staked in solenoid cam and cycle release arm (333) to eliminate drag. Remove and replace arm (333) if it is underbent.

3. Solenoid (Ref. #340, Fig. 15) plunger or solenoid link (Ref. #339, Fig. 15) is binding.

   a. Free parts (339 & 340) from binding. Replace parts (339 & 340) if necessary.

4. Solenoid (Ref. #340, Fig. 15) energized to ground.

   a. Insulate or replace solenoid (340).

20. All Switches and Connections OK, but Mechanism Does Not Cycle

1. Solenoid cam and cycle release arm assembly (Ref. #333, Fig. 15) drags on underside of lower plate riveting assembly (Ref. #269, Fig. 15) or is otherwise prevented from fully traversing its normal travel arc.

   a. Refer to "Complaint #19", Part 2a.

2. Toggle stop link (Ref. #305, Fig. 13) is binding in its lateral motion. Grease or other foreign matter may restrict the normal action of this part.

   a. Clean link (305) and lower plate riveting assembly (Ref. #269, Fig. 13).

   b. Check to see if link (305) is underbent, thus causing it to bind between "E" ring (Ref. #304, Fig. 13) and lower plate (269). Restore free travel or replace link (305).

3. Toggle stop link tension spring (Ref. #306, Fig. 13) weak, missing, or disconnected from toggle stop link (Ref. #305, Fig. 13).

   a. Replace or reconnect spring (306). Test for free travel of link (305).

21. Tape Climbs Capstan (Ref. #266, Fig. 3) and Entangles in Mechanism During "Play & Record" Function

1. Improper take-up assembly (Fig. 3) height adjustment causes poor tape loop forming arm (Ref. #166, Fig. 3) action.

   a. Make "Take-Up Assembly Height Adjustment" as outlined under "MECHANICAL ADJUSTMENTS."

2. End impulse knuckle assembly (Ref. #160, Fig. 8) doesn't "make."

   a. Refer to "Complaint #5", Parts 3a, b, and c under "MECHANICAL ADJUSTMENTS."

3. Take-up assembly (Fig. 3) stalls while capstan (Ref. #266, Fig. 3) still rotates. Poorly dressed wires, a sticky or jammed counter (Ref. #142, Fig. 8) or briefly — anything that may interfere with the rotation of the take-up belt (Ref. #18, Fig. 9) or counter drive belt (Ref. #5, Fig. 8) may cause the take-up assembly to stall.

   a. Dress cables and wires away from take-up assembly to restore free rotation.

   b. Repair or replace counter (142).

CAUTION: Make sure all pieces of tape are removed from over, under, around, and through all parts of the mechanism before operating the unit.

22. Record Key Does Not Release When Cartridge is Rejected after Previous Engagement of the Record Mode

1. Improper record key return arm (Ref. #64, Fig. 3) adjustment.

   a. Make "Record Key Return Arm Adjustment" as outlined under "MECHANICAL ADJUSTMENTS."

ELECTRICAL TROUBLES

The following list of possible troubles pertains to circuit functions involving the amplifier chassis. For troubles involving the master mechanism assembly, refer to section on "MECHANICAL TROUBLES."

1. Unit Dead, Pilot Light (M2, Fig. 3) and Tubes Do Not Light (Early Production Models — Below Serial #3643)

1. Open Circuit in Power supply.

   a. Check for open power cord and replace if defective.

   b. Check for bad power cord connection at power input socket (M22, Fig. 23) and at AC outlet.

   c. Replace blown fuse (M1, Fig. 23). If fuse is blown repeatedly, check for B+ shorts in power supply circuits as per schematic in Fig. 24 .

   d. Check for open On-Off switch (M6, Fig. 20) and replace if defective.

   e. Check for open power transformer (T1, Fig. 20) and replace if defective.

NOTE: In late production models (Serial #3643 and above) a cartridge must be placed on left tape platform before power can be applied to the unit. If this is done and unit still remains dead, refer to "Complaint #1," Parts 1a, b, c, d, and e. In addition, check for open tape platform switch (Ref. #422, Fig. 7) and replace it if defective.

2. Pilot Light (M2, Fig. 3) and Tubes Light, but P. A., Playback, and Record Operations of Both Left and Right Channels are Dead

1. Defective tubes.

   a. Check left-channel tubes (V1, V2, V3, Fig. 3) and right-channel tubes (V4, V5, V6, Fig. 3). Replace defective tubes.

2. Trouble in power supply circuitry.

   a. Check silicon power rectifier (X1, Fig. 23) and associated components. Check B+ voltages associated with power supply as per schematic in Fig. 24. Replace defective components.

3. Muting switch (M4, Fig. 4) leaf contacts are being grounded in mechanical functions of "Load" or "Play & Record".

   a. With mechanism engaged in either "Load" or "Play & Record" function, adjust switch leaf contacts so that they do not touch each other.

NOTE: Muting switch (M4, Fig. 4) leaf contacts should be ungrounded (leaves separated from each other) thru action of cam (Ref. #354, Fig. 5) on mechanism in mechanical functions of "Load" and "Play & Record." In all other mechanical functions, cam operation should cause the switch leaf contacts to short (grounded).

3. Play and Record Operations Normal Thru Left Channel, but No Play or Record Thru Right Channel

1. Trouble in right-channel circuitry.

   a. Check tubes (V4, V5, & V6, Fig. 3) and their associated circuitry. Check voltages of right channel as per schematic in Fig. 24. Replace defective components.

   b. Check for open right-channel section (upper element) of play/record head (Ref. #218, Fig. 19).

   c. Muting switch (M4, Fig. 4) center leaf contact should be grounded.

4. Play and Record Operations Normal Thru Right Channel, but No Play or Record Thru Left Channel

1. Trouble in left-channel circuitry.

   a. Check tubes (V1, V2, & V3, Fig. 3) and their associated circuitry. Check voltages of left channel as per schematic in Fig. 24. Replace defective components.

   b. Check for open left-channel section (lower element) of play-record head (Ref. #218, Fig. 19).

   c. Left-channel muting switch (M4, Fig. 4) leaf contact should be ungrounded.

5. Play Operations Normal of Prerecorded Tape Thru Left and Right Channels, but Play of New Recordings are Weak or Distorted

1. Trouble in erase/bias oscillator circuit.

   a. Check tube (V7, Fig. 3) and associated circuitry. Check voltages of erase/bias circuit as per schematic in Fig. 24. Replace defective components.

   b. Check bias and erase voltages as outlined in procedure for "Erase/Bias Adjustments" under "ELECTRICAL ADJUSTMENTS."

2. Faulty record input signal connections.

   a. Check Input jacks (M8, Fig. 22 and M14, Fig. 23) for proper contact. Ground spring should break contact when input plug is inserted into Input jack. Failure to push plug firmly into jack will cause distortion.

   b. Check microphone or other recording source for quality of signal.

6. P. A. Operations Normal Thru Right and Left Channels, but Play Operations are Dead

1. Trouble in mechanism.

   a. Make certain tape presses against the play/record head when mechanism is engaged in "Play & Record" mechanical function.

2. Faulty connections to play/record head.

   a. Check head cable plug (M20, Fig. 3) connection at head socket (M21, Fig. 20).

   b. Check play/record head socket connection (See Fig. 19) at head.

3. Defective play/record head (Ref. #218, Fig. 19).

   a. Replace head as outlined in procedure under 'REPLACING SOUND HEADS."

4. Defective operation of function selector switch (M3, Fig. 23).

   a. Check to see if Play and Record segments of switch are making proper contact. Clean contacts if they are dirty.

7. Play and P. A. Operations Normal Thru Left Channel, but Record Operations are Dead

1. Trouble in left-channel recording circuit.

   a. Check capacitors (C16, C17, Fig. 21) and resistors (R34, R35, R36, Fig. 22). Replace defective components.

8. Play and P. A. Operations Normal Thru Right Channel, but Record Operations are Dead

1. Trouble in right-channel recording circuit.

a. Check capacitors (C31, C32, Fig. 21) and resistors (R67, R68, R69, Fig. 23). Replace defective components.

9. P.A. Operations Normal Thru Left Channel, but Play Operations are Dead. All Operations Normal Thru Right Channel

1. Trouble in left-channel amplifier circuitry.

   a. Check tube (V1, Fig. 3). Check associated circuitry and voltages of V1A as per schematic in Fig. 24. Replace defective components.

10. P.A. Operations Normal Thru Right Channel, but Play Operations are Dead. All Operations Normal Thru Left Channel

1. Trouble in right-channel preamplifier circuitry.

   a. Check tube (V4, Fig. 3). Check associated circuitry and voltages of V4A as per schematic in Fig. 24. Replace defective components.

11. P.A. Operations Dead Thru Either Left or Right Channel, Play and Record Operations Normal

1. P.A./Monitor - Record Microphone switch (M5, Fig. 23) is in wrong position or switch is defective.

   a. Make sure switch is in P.A./Monitor position.

   b. Replace switch if it is defective.

2. Defective operation of function selector switch (M3, Fig. 23).

   a. Check to see if Record segment of switch is making proper contact. Clean contacts if they are dirty.

12. Left-Channel Record Level Indicator (M9, Fig. 3) Flashes with Signal, but No Sound From Left-Channel Speaker (SP1, Fig. 2) in any Mode of Operation. Sound Normal for Operations Thru Right-Channel Speaker

1. Defective operation of External Speaker jack (M10, Fig. 22) and/or Auxiliary Amplifier jack (M11, Fig. 22).

   a. With external plugs removed from both jacks, check to see that internal silencing contacts remain closed.

2. Open secondary winding on output transformer (T2, Fig. 22).

   a. Replace transformer.

3. Speaker disconnected or open.

   a. Reconnect speaker or replace if open.

13. Right-Channel Record Level Indicator (M15, Fig. 3) Flashes with Signal, but No Sound from Right-Channel Speaker (SP2, Fig. 2) in any Mode of Operation. Sound Normal for Operations Thru Left-Channel Speaker

1. Defective operation of External Speaker jack (M16, Fig. 23) and/or Auxiliary Amplifier jack (M17, Fig. 23).

   a. With external plugs removed from both jacks, check to see that internal silencing contacts remain closed.

2. Open secondary winding on output transformer (T3, Fig. 23).

   a. Replace transformer.

3. Speaker disconnected or open.

   a. Reconnect speaker or replace if open.

14. Weak Volume or Poor High Frequency Response in Play Operations

1. Dirty play/record head (Ref. #218, Fig. 19).

   a. Clean head and associated parts with a pipe cleaner soaked in alcohol.

2. Misaligned play/record head.

   a. Align play/record head as outlined in procedure for "Play/Record Head Adjustments" under "ELECTRICAL ADJUSTMENTS."

3. Trouble in mechanism.

   a. Make certain tape presses against the play/record head when mechanism is engaged in "Play & Record" mechanical function.

4. Head is worn badly and needs replacement.

   a. Replace play/record head as outlined in procedure under "REPLACING SOUND HEADS."

15. Excessive Hum in Play Operations, P.A. Operations Normal

1. Faulty connections to play/record head.

   a. Check head cable plug (M20, Fig. 3) connection at head socket (M21, Fig. 20).

   b. Check play/record head socket connection (See Fig. 19).

2. Tubes (V1 and/or V4, Fig. 3) are defective.

   a. Replace tube(s). Readjust hum controls as outlined in procedure for "Hum Balancing Adjustments" under "ELECTRICAL ADJUSTMENTS."

3. Hum controls misadjusted.

   a. Make "Hum Balancing Adjustments" as outlined under "ELECTRICAL ADJUSTMENTS".

4. Presence of strong inductive field near heads (within 12 inches).

   a. Keep recorder away from hum fields such as fluorescent lamps, amplifiers, transformers, etc.

16. Excessive Hum in P.A. or Record Operations, Play Operations Normal

1. Faulty signal lead connections into record Input jack.

   a. Check and make good signal lead connections to recorder's Input jack.

2. Hum inherited from recording source.

   a. Make a recording from another microphone or external source to determine if hum is inherited from the recording source.

17. No Sound Separation (Stereo Effect) Between Left and Right Channels When Playing Back a Stereo Recording

1. Common signal is being fed to output stages of both channels.

   a. Check to see that muting switch (M4, Fig. 4) leaf contacts — which are connected to control grids of output tubes (V3 and V6, Fig. 3) — do not touch.

NOTE: These contacts should be opened thru action of cam (Ref. #354, Fig. 5) on mechanism in mechanical functions of "Load" and "Play & Record". In all other mechanical functions, cam operation should cause leaf contacts to touch. Therefore, if contacts are touching with mechanism engaged in either "Load" or "Play & Record" position, retain "Load" or "Play & Record" position of mechanism and adjust leaves so that they remain separated. Thereafter, check for proper switch operation (contacts closed) by engaging all other functions.

18. Weak or No Erase, Records Over Previous Recording

1. Trouble in erase/bias oscillator circuits.

   a. Check tube (V7, Fig. 3) and associated circuitry. Check voltages of erase/bias circuits as per schematic in Fig. 24. Replace defective components.

   b. Check erase voltage as outlined in procedure for "Erase/Bias Adjustments" under "ELECTRICAL ADJUSTMENTS."

2. Dirty erase head (Ref. #245, Fig. 19).

   a. Clean head and associated parts with a pipe cleaner soaked in alcohol.

3. Faulty connection to erase head.

   a. Check erase head socket connection (See Fig. 19).

4. Defective erase head.

   a. Replace head as outlined in procedure under "REPLACING SOUND HEADS."

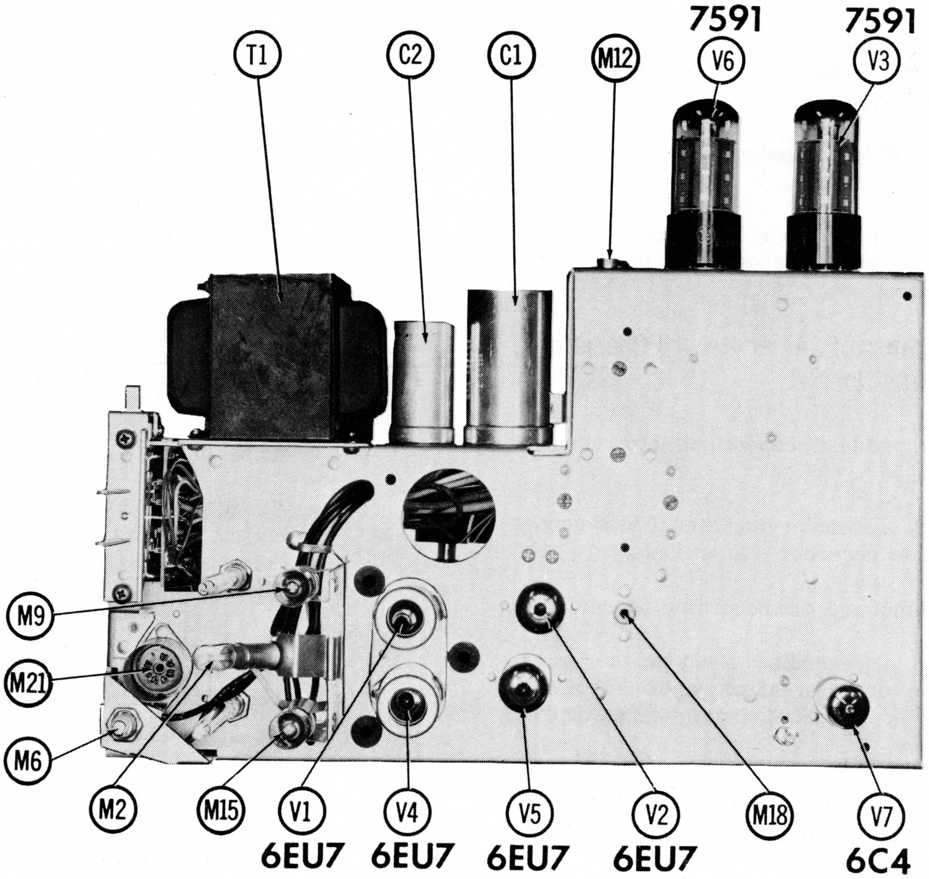


Fig. 20. Top View of Amplifier Chassis After Removal from Master Mechanism Assembly.

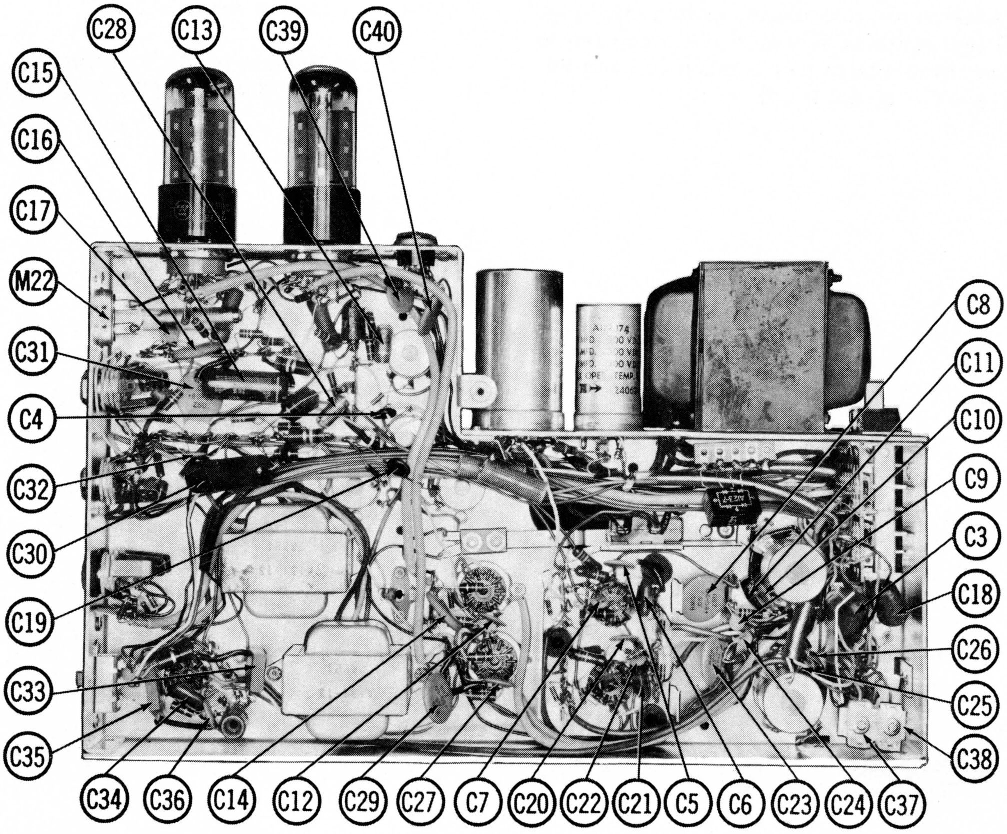


Fig. 21. Bottom View of Amplifier Chassis — Capacitor Identification (Left & Right Channels).

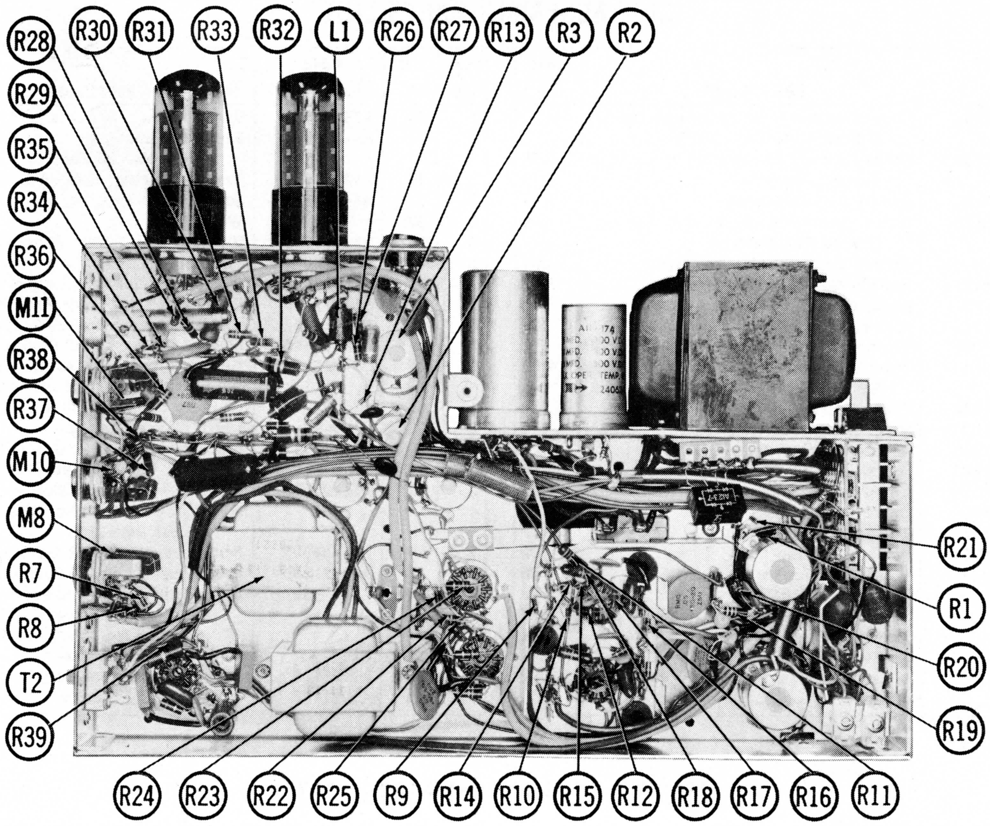


Fig. 22. Bottom View of Amplifier Chassis — Resistor, Coil, Transformer, and Miscellaneous Component Identification (Left Channel).

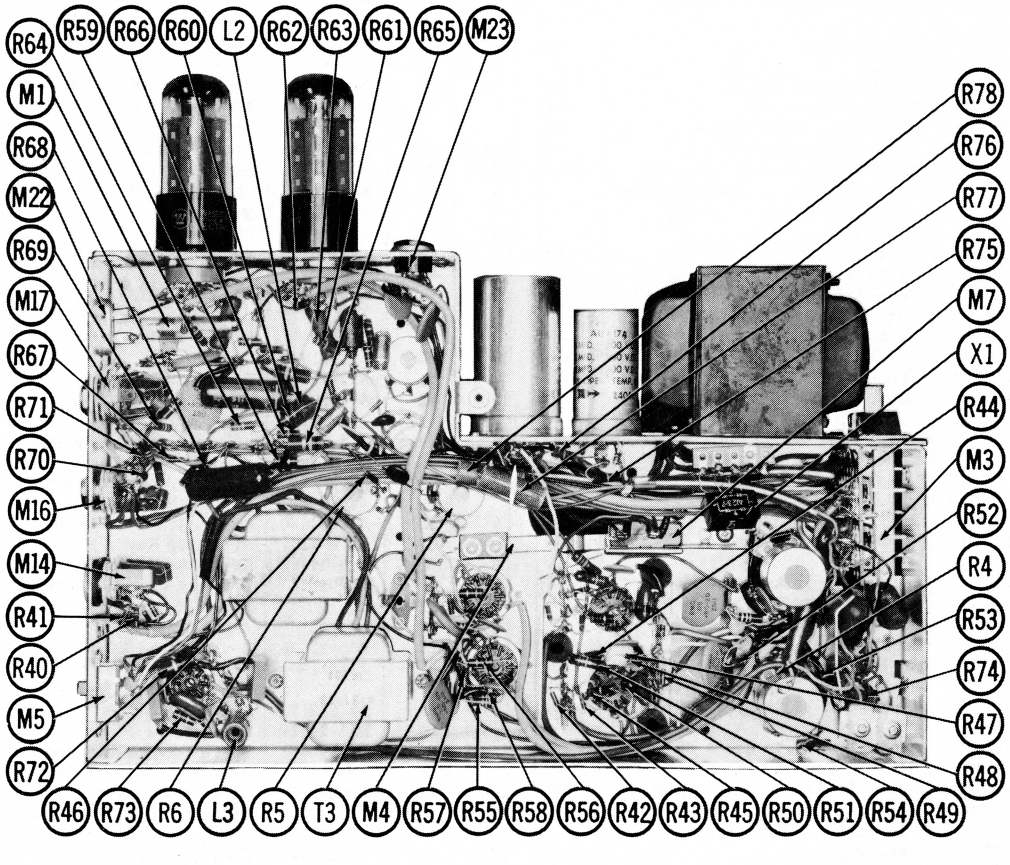


Fig. 23. Bottom View of Amplifier Chassis — Resistor, Coil, Transformer, and Miscellaneous Component Identification (Right Channel).

CASE ASSEMBLY PARTS LIST

Fig. No.	Ref. No.	Part No.	Description	List Price
2		R1-21800	Case Assembly: Includes Ref. No's. 1 Thru 42 and SP1, SP2	
2	1	A14-12053	Screw, Sems; #6-32 x 3/16" Lg. Slotted Pan Head	.08
2	2	C1-21810	Back Panel Assembly	4.47
2	3	A14-12053	Screw, Sems; #6-32 x 3/16" Lg. Slotted Pan Head	.08
2	4	SPA-831-B	Screw, Tapping; #6 Hex. Head	.08
2	5	C1-21812	Bottom Cover Assembly	3.01
2	6		Knob, Repeat - Change	
2	7	A14-21589	Screw, Case; #6-32 x 5/16" Lg.	.08
2	8	C1-21803	Bezel and Nameplate Assembly	
2	9	C1-21814	Top Cover Panel Assembly: Includes Ref. No's. 10 Thru 19	4.53
2	10	B15-21633	Knob, Reject	.09
2	11	A12-21504	Shoe, Nameplate (Reject)	.18
2	12	A13-21546	Tension Spring, Reject Knob	.08
2	13	A14-21597	Screw, Reject Knob	.08
2	14		Cover Latch Knob and Stud Assembly	.45
2	15	A9-21450	Drive Pin, Latch Tongue	.08
2	16	A3-21315	Tongue, Latch	.18
2	17	A8-14793	Washer, Spring	.08
2	18	A8-14441	Washer, Nylon	.08
2	19	A9-11888	"E" Ring, 3/16"	.08
2	20	A14-14735	Screw, Slotted Fillister Head; #4-40	.08
2	21	B15-21652	Knob, Rewind-Advance	.10
2	22	A14-21600	Screw, Case; #6-32 x 7/16" Lg.	.08
2	23	A14-21931	Screw, Phillips Pan Head; #6-32 x 7/32" Lg.	.08
2	24	A14-21600	Screw, Case; #6-32 x 7/16" Lg.	.08
2	25	R1-21807	Front Casting Assembly: Includes Ref. No's. 26 Thru 32	11.22
2	26	A13-21560	Tension Spring, Record Lock	.16
2	27	A14-18280	Screw, Self-Tapping; #4	.08
2	28		Washer	.08
2	29	A1-21127	Record Lock Button Assembly	.21
2	30	A9-11888	"E" Ring, 3/16"	.08
2	31	A13-14996	Spring, On-Off Key Return	.08
2	32	A1-21114	On-Off Key and Shaft Assembly	.71
2	33	B1-21804	Handle and Nameplate Assembly	3.74
2	34	A14-21595	Screw, Sems; #6-32 Slotted Hex. Head	.08
2	35	C1-21808	Left Side Casting Assembly: Includes Left-Channel Speaker (SP1) and Ref. No's. 36 & 37.	18.08
2	SP1	C160-20	Left-Channel Speaker	5.50
2	36	A9-22672	Cup Washer (4 Used on Ref. No. SP1 and 4 Used on Ref. No. SP2)	.08
2	37	A14-21595	Screw, Sems; #6-32 Slotted Hex. Head (4 Used on Ref. No. SP1 and 4 Used on Ref. No. SP2)	.08
2	38	A14-21595	Screw, Sems; #6-32 Slotted Hex. Head	.08
2	39	A14-21595	Screw, Sems; #6-32 Slotted Hex. Head	.08
2	40	C1-21809	Right Side Casting Assembly: Includes Right-Channel Speaker (Ref. No. SP2) and Ref. No's. 36 & 37	17.99
2	SP2	C160-20	Right-Channel Speaker	5.50
2	41	A1-21117	Volume Knob Assembly	.55
2	42	A1-21116	Tone Knob Assembly	.60

MASTER MECHANISM PARTS LIST

Fig. No.	Ref. No.	Part No.	Description	List Price
5		R1-21815	Master Mechanism Assembly: Includes Ref. No's. 1 Thru 435	194.30
9, 10 & 12	1	R1-21834	Upper Plate Riveting Assembly	6.97
9	2	A9-17857	Crescent Ring	.08
9	3	A8-12642	Washer	.08
9	4	A15-21638	Pulley, Counter Drive	.08
9	5	A30-21678	Belt, Counter Drive	.18
9	6	A4-21374	Knurled Nut, Top Flange	.09
9	7	B3-21254	Top Flange, Take-Up	.46
9		B1-21864	Take-Up Hub, Clutch Plate, and Bottom Flange Assembly: Includes Ref. No's. 8 Thru 11, 15 and 16, and 22	2.42
9	8	A9-13199	"E" Ring, 1/8"	.08
9	9	A13-6432	Compression Spring, Conical	.08
9	10	A1-21866	Take-Up Hub and Top Flange Ass'y.	.59
9	11	A30-21672	Tire, Take-Up Hub	.09
9	12	A8-12642	Washer	.08
9	13	A9-11888	"E" Ring, 3/16"	.08
9	14	A13-17859	Compression Spring, Take-Up Clutch	.08
9	15	A13-21572	Compression Spring, Conical; Take-Up Clutch	.08
9	16	A1-21875	Clutch and Felt Pad Assembly	.49
9	17	A1-21077	Clutch Drive Drum and Felt Pad Assembly	.30
9	18	A30-21670	Belt, Take-Up	.18
9	19	A4-21370	Shaft, Take-Up Reel	.62
9	20	B15-21620	Guide Ring, Take-Up	.34
9	21	A8-12642	Washer	.08
9	22	B1-21105	Bottom Flange Assembly	.59
9	23	A14-21590	Screw, Phillips Round Head; #4-40	.08
9	24	A14-21590	Screw, Phillips Round Head; #4-40	.08
9	25	A3-21308	Switch Shield, Loop Arm	.29
9	26	A9-21429	Insulator, Loop Arm Switch	.08
9	27	A141-27	Switch, Loop Arm	3.10
9	28	A14-11977	Screw, Self-Tapping; #4 Slotted Pan Head	.08
9	29	A14-10999	Screw, Slotted Pan Head; #4-40	.08
9	30	A3-21236	Bracket, Loop Arm Switch	.27
9	31	A14-10999	Screw, Slotted Pan Head, #4-40	.08
9		B1-21861	Rapid Forward Idler Slide Assembly: Includes Ref. No's. 32 Thru 40	1.46
9	32	A9-4737	Retaining Ring	.08
9	33	A8-5392	Flat Washer, 3/16" x 5/16" x .012" Thick	.08
9	34	A11-21484	Thrust Bearing Assembly	.20
9	36	A1-21863	Upper Rapid Forward Drive Clutch Assembly: Includes Ref. No. 37	.46
9	37	A30-21674	Clutch Tire, Rapid Forward Drive	.08
9	38	A15-21617	Drive Clutch, Lower Rapid Forward	.10
9	39	A8-5459	Flat Washer, 3/16" x 11/32" x .005" Thick	.08
9	40	A1-21862	Rapid Forward Idler Slide Pin Ass'y.	.43
9	41	A13-21574	Tension Spring, Rapid Forward Idler Slide Assembly	.08
9&16	42	A3-21214	Plunger, Stop Key	.08
9	43	A9-22404	Rollpin, 3/32" Dia. x 1 1/2" Lg.	.08
9	44	A9-11888	"E" Ring, 3/16"	.08
9	45	A4-21349	Shaft, Key	.30
9	46	A9-13199	"E" Ring, 1/8"	.08
9	47	A8-16014	Washer	.08
9	48	A8-5824	Washer	.08
9		A1-21096	Key Roller Slide Assembly: Includes Ref. No's. 49 Thru 53	1.00
9	49	A4-21350	Shaft, Function Roller	.08
9	50	A9-13199	"E" Ring, 1/8"	.08
9	51	A15-14450	Roller, Slide	.08
9	52	A4-21351	Roller, Function	.45
9	53	B3-21218	Slide, Key Roller	.29
9	54	A13-21550	Tension Spring, Slide Return	.08
9	55	A8-6433	Washer	.08
9		A1-21124	Stop Key Assembly: Includes Ref. No's. 56 Thru 58	.49
9	56	A14-14430	Screw, Self-Tapping; #6	.08
9	57	B3-21215	Arm, Stop Key	.10
9	58	B15-21629	Key, Stop	.29
9		A1-21125	Play Key Assembly: Includes Ref. No's. 56, 59, and 60	.48
9	59	B3-21216	Arm, Play Key	.09
9	60	B15-21630	Key, Play	.29
9		A1-21126	Record Key Assembly: Includes Ref. No's. 56, 61, and 62	.73
9	61	B3-21217	Arm, Record Key	.29
9	62	B15-21631	Key, Record	.29
9	63	A13-21531	Torsion Spring, Key Return	.12
9	64	A3-21165	Arm, Record Key Return	.11
9	65	A3-21237	Latch, Roller Slide	.08
9	66	A13-21551	Tension Spring, Slide Latch	.08
9	67	A9-13200	"E" Ring, 5/32"	.08
9	68	A9-21451	Clamp, Cable	.08
9	69	A9-21457	Retaining Ring, Circular Self-Locking	.08
9		A1-21860	Drive Roller Assembly: Includes Ref. No's. 72 Thru 79	1.64

MASTER MECHANISM PARTS LIST (Cont'd.)

Fig. No.	Ref. No.	Part No.	Description	List Price
9&14	70	A9-11888	"E" Ring, 3/16"	.08
9	71	A8-5475	Washer	.08
9	72	A9-21441	Retaining Ring	.08
9	73	A8-21688	Washer, Cartridge Drive Roller	.08
9	74	A13-21533	Compression Spring, Drive Roller	.08
9	75	A1-21858	Cartridge Drive Roller Assembly: Includes Ref. No's. 76 and 77	.82
9	76	A30-21679	Drive Tire, Upper Feed-Out	.08
9	77	A30-21675	Drive Tire, Lower Feed-Out	.08
9	78	A1-21857	Cartridge Drive Roller Hub Ass'y. Includes Ref. No. 79	.55
9	79	A30-21676	Clutch Tire, Feed-Out	.08
9	80	A8-5475	Washer	.08
9	81	A9-11888	"E" Ring, 3/16"	.08
9	82	A9-11888	"E" Ring, 3/16"	.08
9	83	A15-21621	Pulley, Cartridge Drive Roller	.09
9	84	A30-21671	Drive Belt, Feed-Out	.17
9	85	A9-11888	"E" Ring, 3/16"	.08
9	86	A1-21082	Feed Drive Idler Arm Assembly	.54
9	87	A9-12315	Grip Ring	.08
9	88	A1-21099	Capstan Pulley Assembly	.26
9	89	A9-21385	Drive Pin, Capstan Pulley	.08
9	90	A1-21088	Rewind Idler Assembly	.90
9	91	A1-21111	Rewind Idler Slide Assembly	.84
9	92	A3-21190	Link, Rewind Idler	.14
9	93	A13-21544	Tension Spring, Rewind Idler Link	.08
9	94	A8-14441	Washer	.08
9	95	A8-5475	Washer	.08
9	96	A9-11888	"E" Ring, 3/16"	.08
9		A1-21870	Cartridge Brake Assembly: Includes Ref. No's. 97 Thru 103	.86
9	97	A9-13200	"E" Ring, 5/32"	.08
9	98	A8-5818	Flat Washer	.08
9	99	A1-21869	Brake Roller and Tire Assembly: Includes Ref. No. 100	.29
9	100	A30-21673	Brake Tire	.08
9	101	A8-5818	Flat Washer	.08
9	102	A13-6829	Spring Washer	.08
9	103	A1-21871	Cartridge Brake and Shaft Assembly	.39
9	104	A13-21549	Tension Spring, Cartridge Brake	.10
9	105	A9-12670	"E" Ring, 1/4"	.08
9	106	A9-11888	"E" Ring, 3/16"	.08
9&10	107	B1-21078	Clutch Cam Arm Assembly	1.01
9	108	B1-21104	Motor Drive Pulley Assembly: Includes Ref. No. 109	2.40
9	109	A17-12656	Set Screw, #8-32	.08
9	110	A14-11118	Screw, Sheet Metal; #6	.08
9	111	A9-11888	"E" Ring, 3/16"	.08
9	112	A8-5475	Washer	.08
9&12	113	A1-21079	Cycle Idler Slide and Felt Pad Ass'y.	.34
9		A1-21867	Take-Up Brake Arm Assembly: Includes Ref. No's. 114 Thru 120	.88
9	114	A9-13200	"E" Ring, 5/32"	.08
9	115	A8-5818	Flat Washer	.08
9	116	A1-21869	Brake Roller and Tire Assembly: Includes Ref. No. 117	.29
9	117	A30-21673	Brake Tire	.08
9	118	A8-5818	Flat Washer	.08
9	119	A13-6829	Spring Washer	.08
9	120	A1-21868	Take-up Brake Arm and Shaft Ass'y.	.40
9	121	A9-11888	"E" Ring, 3/16"	.08
9	122	A13-21545	Tension Spring, Take-Up Brake	.16
9	123	A13-21552	Wire Form, Take-Up Brake	.08
9	124	A1-21087	Rewind Feed Selector Arm Assembly	.34
9	125	A13-17964	Tension Spring, Rewind Feed Selector	.08
9	126	A9-13199	"E" Ring, 1/8"	.08
9	127	A8-16014	Washer	.08
9	128	A9-11888	"E" Ring, 3/16"	.08
9	129	A1-21089	Rewind Bell Crank Assembly	.17
9	130	A9-13200	"E" Ring, 5/32"	.08
9	131	A8-5406	Washer	.08
9	132	A30-21669	Pressure Roller	.63
9&10	133	B1-21106	Pressure Roller Arm Assembly	1.31
9	134	A13-14424	Tension Spring, Pressure Roller	.08
9	135	B3-21193	Lever, Start Key	.15
9	136	A9-13200	"E" Ring, 5/32"	.08
9	137	A8-17729	Washer	.08
9&10	138	A13-21548	Tension Spring, Tape Loop Forming Arm	.14
9	139	A14-21594	Screw, Sems; #10-32 Slotted Hex. Head	.08
9	140	A3-21179	Rewind Link	.12
9	141	A14-10999	Screw, Slotted Pan Head; #4-40	.08
9	142	B9-21390	Counter	7.83
9&12	143	A3-21241	Arm, Counter Release	.11
9&12	144	A13-21570	Tension Spring, Counter Reset	.22
9	145	A9-13199	"E" Ring, 1/8"	.08
9	146	A4-21362	Shaft, Counter Release Arm	.08
9	147	A9-13200	"E" Ring, 5/32"	.08
9	148	A3-21191	Lever, Stop Key Disengaging	.08
9	149	A14-21595	Screw, Sems; #6-32 Slotted Hex. Head	.08
9	150	A14-21595	Screw, Sems; #6-32 Slotted Hex. Head	.08
9	151	A14-21595	Screw, Sems; #6-32 Slotted Hex. Head	.08
9	152	A9-21458	Lug	.08
9	153	A9-13200	"E" Ring, 5/32"	.08
9	154	A8-5406	Washer	.08
9	155	A13-14421	Tension Spring, Tape Loop Forming Arm	.08
10	156	A9-13200	"E" Ring, 5/32"	.08
10	157	A3-21224	Loop Arm Link	.17
10	158	A8-5818	Washer	.08
10	159	A9-11888	"E" Ring, 3/16"	.08
10	160	A1-21101	End Impulse Knuckle Assembly	.65
10	161	A9-11888	"E" Ring, 3/16"	.08
10	162	A13-21543	Tension Spring, End Impulse Knuckle	.17
10	163	A13-21537	Tension Spring, Jaw Opening Arm	.09
10	164	B1-21090	Jaw Opening Toggle Arm Assembly	.31
10	165	A8-5459	Washer	.08
10 &16	166	B1-21103	Tape Loop Forming Arm Assembly	1.04
10	167	A9-12670	"E" Ring, 1/4"	.08
10	168	B1-21095	Cam Follower, Loop Arm Actuator, and Bearing Assembly	.63
10	169	A1-21100	Radius Arm Assembly	.26
10	170	A13-21536	Tension Spring, Pressure Pad Release	.08
10	171	A9-12670	"E" Ring, 1/4"	.08
10	172	B1-21097	Automatic Rewind Feed-Out Selector Assembly	.45
10	173	A13-21561	Tension Spring, Automatic Rewind Feed-Out Selector	.17
10	174	A9-11888	"E" Ring, 3/16"	.08
10	175	A8-5459	Washer	.08
10	176	A3-21162	Arm, Sensing Jaw Positioning	.10
10	177	A9-21454	Pin, Spiral	.08
10	178	A13-21535	Tension Spring, Pressure Pad	.08
9 &10	179	A3-21235	Loop Arm Actuator, Stop-Start	.36
10	180	A8-5459	Washer	.08
10	181	A1-21098	Reject Arm Assembly	.45
10	182	A13-17164	Tension Spring, Reject Arm	.18
10	183	A9-11888	"E" Ring, 3/16"	.08
10	184	A13-21569	Tension Spring, 3-Way Switch Arm	.18
10	185	A3-21230	Arm, 3-Way Switch	.24
10	186	A8-17339	Washer	.08
10	187	A14-21591	Screw, Phillips Round Head; #4-40	.08
10	188	A141-49	Switch, Reject	.81
10	189	A141-49	Switch, Play-Record	.81
10	190	A9-12670	"E" Ring, 1/4"	.08
10,12	191	A8-17729	Washer	.08
10	192	A1-21854	Jaw Opening Cam and Loop Arm Actuator Cam Assembly (Mechanical Function Indicator)	.68
10	193	A9-21426	Drive Pin, Upper Cams	.08
10	194	A9-12670	"E" Ring, 1/4"	.08
10	195	A2-21158	Cam, Clutch Take-Up	.34
10	196	A1-21843	Cam (Pressure Roller Arm, 3-Way Switch) and Rollpin Assembly	.37
10	197	A9-21426	Drive Pin, Upper Cams	.08
10	198	A1-21115	Rewind Cam and Hub Assembly	.49
10	199	A9-12670	"E" Ring, 1/4"	.08
10,12, 14&16	200	A4-21343	Shaft, Cam Stack	.47
10,12, 14&16	201	A4-21391	Shaft, Multiple Follower Arm	.32
10	202	A14-16300	Screw, Straight Sided Binding Hd;#3-48	.08
10	203	A4-21700	Screw, Tape Guide Ass'y. Hold Down	.08
10	204	A13-21547	Tension Spring, Sensing Jaws	.28
10	205	A9-17376	Retaining Ring, Circular Self-Locking	.08
10	206	A9-21451	Clamp, Cable	.08
10	207	A8-17339	Washer	.08
10	208	A9-11888	"E" Ring, 3/16"	.08
10	209	A4-21345	Screw, Tape Guide Ass'y. Hold Down	.08
10	210	A9-13199	"E" Ring, 1/8"	.08
10	211	A8-10240	Washer	.08
10	212	A1-21091	Sensing Jaw Opening Arm Assembly	.16
10		C1-21844	Tape and Sensing Unit Assembly: Includes Ref. No's. 213 Thru 249	54.86
10	213	A14-21583	Screw, #2-56 Fillister Head	.08
10	214	A13-21528	Spring, Azimuth Adjust	.09
10	215	A14-21580	Screw, Azimuth Adjust; #2-56	.08
10	216	A3-21174	Mounting Plate, Record Head	.13
10		A1-21851	Record Head Assembly: Includes Ref. No's. 217 Thru 219	31.48
10	217	A1-21852	Record Head and Bracket Assembly: Includes Ref. No. 218	31.18

MASTER MECHANISM PARTS LIST (Cont'd.)

Fig. No.	Ref. No.	Part No.	Description	List Price
10	218	B-161-9	Record Head (Shure)	30.15
		B-161-16	Record Head (Nortronics)	34.25
10	219	A4-21417	Screw, Head Height Adjust	.15
10	220	A9-11888	"E" Ring, 3/16"	.08
10	221	A13-21534	Spring, Sensing Jaw Latch	.08
10		B1-21846	Sensing Jaw Assembly: Includes Ref. No's. 222 Thru 226	.80
10	222	A3-21175	Sensing Jaw, Left	.17
10	223	A1-21119	Sensing Jaw and Holding Tab Assembly Right	.26
10	224	A13-21532	Compression Spring, Sensing Jaw	.08
10	225	A4-21382	Sliding Shaft, Sensing Unit	.10
10	226	A9-13199	"E" Ring, 1/8"	.08
10	227	A3-21163	Latch, Sensing Jaw	.08
10	228	A14-21582	Screw, #2-56 Fillister Head	.08
10	229	A14-21579	Screw, #2-56 Fillister Head	.08
10	230	A14-5804	Screw, Pivot Stud Mounting	.08
10	231	A1-21845	Rear Support and Pivot Stud Assembly	.19
10	232	C15-21656	Tape Path, Top Plate	2.48
10	233	A9-11317	Nut, #2-56 Hex	.08
10	234	A1-21847	Tape Pressure Pad Arm and Felt Pad Assembly	.08
10	235	A14-21582	Screw, #2-56 Fillister Head	.08
10	236	A15-21654	Front Support	.10
10	237	A4-21389	Spacer, Tape Guide (6 Used)	.14
10	238	A4-21418	Spacer, Record Head (3 Used)	.19
10	239	C15-21655	Tape Path, Bottom Plate	2.64
10	240	A14-16221	Screw, #2-56 Fillister Head	.08
10	241	A14-21580	Screw, #2-56 Pan Head	.08
10	242	A14-21583	Screw, #2-56 Fillister Head	.08
10	243	A9-22357	Nut, #2-56 Hex.	.08
10		A1-21848	Erase Head and Felt Assembly: Includes Ref. No's. 244 and 245	9.83
10	244	A1-21850	Erase Head Bracket Assembly	.41
10	245	B161-10	Erase Head	9.41
10	246	A9-11317	Nut, #2-56 Hex.	.08
10	247	A13-6829	Spring Washer	.08
10	248	A4-21387	Mounting Stud, Erase Head	.33
10	249	A15-21640	Tape Guide, Contour	.08
12	250	A9-12670	"E" Ring, 1/4"	.08
12	251	A9-11888	"E" Ring, 3/16"	.08
12	252	A9-21425	Drive Pin, Middle Cam	.08
12&14	253	B15-21626	Cam, Feed-Out Roller and Idler Switching Cam	.08
12	254	A9-13199	"E" Ring, 1/8"	.08
12	254-1	A4-21638	Shaft, Clutch Lifter Pivot Link	.18
12	254-2	A4-21639	Shaft, Clutch Lifter	.08
12	255	A4-21354	Spacer, Mechanism Plates	.24
12	256	A1-21102	Pivot Slide Arm Assembly	.33
9&12	257	A3-21189	Lifter, Clutch	.46
12	258	A3-21188	Link, Clutch Lifter Plate	.15
12	259	A1-21084	Slide Cycle Idler Bearing and Felt Pad Assembly	.36
12	260	A8-5475	Washer	.08
12	261	A1-21081	Idler Assembly	.95 [illegible]
12	262	A8-16263	Washer	.08
12	263	A8-17317	Washer	.08
12	264	A8-17696	Washer	.08
12	265	A17-12656	Setscrew	.08
12&16	266	B1-21873	Flywheel Assembly	5.20
12	267	A8-11872	Washer	.08
12	268	A11-18183	Thrust Bearing	.15
14&16	269	R1-21835	Lower Plate Riveting Assembly	9.38
14		B1-21118	Play Idler and Slide Assembly: Includes Ref. No's. 270 Thru 274	1.69
14	270	A1-21081	Idler Assembly	.85
14	271	A8-5459	Flat Washer, 3/16"x11/32"x.005"	.08
14	272	B3-21207	Slide, Play Idler	.37
14	273	A9-11888	"E" Ring, 3/16"	.08
14	274	A13-21568	Tension Spring, Play Idler and Slide Assembly	.19
14	275	A9-12670	"E" Ring, 1/4"	.08
14&16	276	B1-21107	Search Lever Assembly	.95
14	277	A3-21204	Arm, Feed Roller Release	.33
14	278	A9-12670	"E" Ring, 1/4"	.08
14	279	B3-21242	Arm, Counter Release Actuator	.18
14	280	A8-17699	Washer	.18
14	281	A9-13199	"E" Ring, 1/8"	.08
14	282	A3-21211	Interlock, Search Lever	.08
14	283	A13-21567	Tension Spring, Play Idler Actuator	.17
14	284	B3-21206	Actuator, Play Idler	.31
14	285	A9-11888	"E" Ring, 3/16"	.08
14	286	A9-12670	"E" Ring, 1/4"	.08
14	287	B3-21205	Actuator, Cycle Idler	.21
14	288	A13-21566	Tension Spring, Cycle Idler Actuator	.16
14&16	289	B1-21094	Power Cam Roller Arm Assembly	1.34
14	290	A8-17699	Washer	.08
14	291	A9-11888	"E" Ring, 3/16"	.08

Fig. No.	Ref. No.	Part No.	Description	List Price
14&16	292	A3-21186	Cam Follower, Toggle Link	.08
14	293	A13-21565	Tension Spring, Cam Roller Arm	.12
14	294	A4-21364	Shaft, Drive Roller	.54
14	295	B1-21856	Feed Roller Arm and Clinch Nut Assembly	.69
14	296	A8-6313	Washer	.08
14	297	A13-21562	Compression Spring, On-Off Wire Form	.08
9&14	298	A13-21553	Wire Form, On-Off	.08
14	299	A13-21554	Wire Form, Rapid Forward	.08
14	300	A13-21557	Tension Spring, Feed Roller Arm	1.67
14	301	B1-21872	Feed Roller Cam Follower Arm Assembly	.43
14	302	A9-12670	"E" Ring, 1/4"	.08
14	303	A13-21564	Tension Spring, Feed Roller Cam Follower Arm	.13
14	304	A9-11888	"E" Ring, 3/16"	.08
14	305	A3-21231	Link, Toggle Stop	.08
14	306	A13-21556	Tension Spring, Toggle Stop Link	.12
14	307	A9-21459	#12-24 Elastic Stop Nut, Motor Mtg.	.08
14	308	A8-14399	Washer	.08
16	309	A13-17164	Tension Spring, Unidirectional Clutch Pawl	.12
16	310	A3-21253	Pawl, Unidirectional Clutch	.08
16	311	A9-13199	"E" Ring, 1/8"	.08
16	312	A4-21362	Shaft, Unidirectional Clutch Pawl	.08
16	313	A13-21563	Compression Spring Search Lever Detent Arm	.08
9&16	314	B3-21210	Arm, Search Lever Detent	.20
16	315	A9-13199	"E" Ring, 1/8"	.08
16	316	A15-21651	Roller, Search Lever Detent Arm	.08
16	317	A4-21397	Pivot Pin, Search Lever Detent Arm	.08
16	318	A9-11184	Keps Nut, #10-32	.08
16	319	A14-21587	Screw, Changer Mounting	.28
16	319-1	A14-21587	Screw, Changer Mounting	.28
16	320	A4-21393	Spacer, Cam Follower Arm Shaft	.10
16		A1-21092	Changer Incline Cam Arm Assembly: Includes Ref. No's. 321 Thru 324	.42
16	321	A3-21282	Arm, Incline Cam Rocker	.22
16	322	A9-13199	"E" Ring, 1/8"	.08
16	323	A4-21392	Shaft, Cam Follower Roller	.08
16	324	A9-21443	Ball Bearing, .457" Diameter	.08
16	325	A9-11888	"E" Ring, 3/16"	.08
16	326	A3-21285	Link, Incline Lifter Connector	.08
16	327	A13-17859	Compression Spring, Incline Lifter Connector Link	.08
16	328	A8-5406	Washer	.08
16	329	A9-13200	"E" Ring, 5/32"	.08
7&16	330	A9-11888	"E" Ring, 3/16"	.08
7&16	331	A1-21831	Transfer Crank Arm Assembly	.28
16	332	A9-11888	"E" Ring, 3/16"	.08
16	333	A1-21083	Solenoid Cam & Cycle Release Arm Assembly	.20
16	334	A9-12670	"E" Ring, 1/4"	.08
16	335	A13-21559	Tension Spring, Solenoid Knuckle	.22
16	336	B1-21093	Table Lifter Cam Arm Assembly	.66
16	337	A9-11888	"E" Ring, 3/16"	.08
16	338	A13-21558	Tension Spring, Solenoid Link	.12
16	339	A3-21222	Link, Solenoid	.09
16	340	A134-8	Solenoid Assembly	3.59
16	341	A3-21252	Clamp, Solenoid	.08
16	342	A14-21596	Screw, Sems Hex. Head; #6-32	.08
16	343	A1-21085	Cam Arm, Load Pawls and Pin Ass'y.	.26
16	344	A1-21086	Transfer Crank Arm Ass'y. (Ld. Pawls)	.24
16	344-1	A1-21086	Transfer Crank Arm Ass'y. (Ld. Pawls)	.24
16	345	A3-21293	Link, Transfer (Load Pawls)	.20
10&16	346	A9-13200	"E" Ring, 5/32"	.08
16	347	A1-21120	Power Cam & Tire Assembly	1.43
16	348	A9-17705	"E" Ring, 5/16"	.08
16	349	A1-21108	Ratchet Drive and Stud Assembly	1.03
16	350	A9-21424	Drive Pin, Bottom Cam	.08
16	351	A1-21842	Ratchet Cam Assembly	.46
16	352	A3-21262	Link, Spacer	.08
16	353	A9-21425	Drive Pin	.08
16	354	B15-21642	Cam, Cartridge Pawls and Amplifier Switches	.17
16	355	A8-17729	Washer	.08
16	356	A9-12670	"E" Ring, 1/4"	.08
16	358	A30-14023	Motor Mount	.08
16	358-1	A30-21688	Motor Mount	.08
16	359	A4-21427	Stud, Motor Mounting	.08
16	360	C9-21428	Motor	15.39
16	361	A9-21439	#12-24 Nut, Keps Hex.	.08
16	362	A9-12670	"E" Ring, 1/4"	.08
16	364	B15-21658	Fan, Motor	.54
6		R1-21816	Changer Assembly: Includes Ref. No's. 365 Thru 435, 330, and 331	29.56

MASTER MECHANISM PARTS LIST (Cont'd.)

Fig. No.	Ref. No.	Part No.	Description	List Price
7		C1-21817	Front Changer Wall Load and Stack Pawl Assembly: Includes Ref. No's. 366 Thru 382	5.23
7	365	SPA-831-B	Screw, #6 Tapping (16 Used)	.08
7	366	B1-21823	Front Changer Wall Riveted Assembly	2.00
7	367	A9-13199	"E" Ring, 1/8"	.08
7	368	B3-21295	Load Pawl, Left	.08
7	369	A13-21571	Torsion Spring, Right Load Pawl	.08
7	370	A3-21296	Load Pawl, Right	.13
7	371	A1-21825	Front Cartridge Guide Arm Assembly	.44
7	372	A3-21299	Stack Pawl, Left	.10
7	373	A4-21335	Pivot Pin, Stack Pawl and Cartridge Guide Arm	.08
7	374	A3-21300	Stack Pawl, Right	.08
7	375	A4-21397	Pivot Pin, Right Stack Pawl	.08
7	376	A13-21539	Torsion Spring, Stack Pawls	.08
7	377	A4-21408	Pivot Shaft, Load Pawls	.08
7	378	A3-21290	Slide Link, Changer Table Lifter	.20
7	379	A8-5392	Washer, .187" x .313" x .012" Thick	.08
7	380	A9-11888	"E" Ring, 3/16"	.08
7	382	A13-21538	Spring, Cartridge Guide Arm	.08
7	383	A1-21121	Left Changer Wall Assembly	.86
7		C1-21818	Rear Changer Wall Load and Stack Pawl Assembly: Includes Ref. No's. 384 Thru 395	3.53
7	384	B1-21824	Rear Changer Wall Riveted Assembly	1.29
7	385	A9-13199	"E" Ring, 1/8"	.08
7	386	A4-21409	Shaft, Rear Load Pawl	.15
7	387	A3-21297	Load Pawl, Rear	.20
7	388	A13-21540	Spring, Rear Load Pawl	.08
7	389	A13-21538	Spring, Cartridge Guide Arm	.08
7	390	A1-21826	Rear Cartridge Guide Arm Assembly	.35
7	391	A13-21539	Spring, Stack Pawl	.08
7	392	A3-21300	Stack Pawl, Left	.08
7	393	A4-21335	Pivot Pin, Stack Pawl and Cartridge Guide Arm	.08
7	394	A3-21299	Stack Pawl, Right	.10
7	395	A4-21397	Pivot Pin, Stack Pawl	.08
7	396	A9-11888	"E" Ring, 3/16"	.08
7	397	A4-21401	Pivot Shaft, Incline Frame	.19
7		B1-21833	Right Changer Wall Assembly: Includes Ref. No's. 398 Thru 401	2.33
7	398	B1-21832	Right Changer Wall and Bracket Riveted Assembly	1.05
7	399	A9-21446	#5-40 Stop Nut, Elastic	.08
7	400	A14-21588	Screw, #5-40 Round Head	.08
7	401	B3-21314	Lever, Repeat	.98
7	402	A1-21821	Long Incline Stop Bracket and Nut Assembly	.26

Fig. No.	Ref. No.	Part No.	Description	List Price
7	403	A14-21595	Screw, Sems; #6-32 Slotted Hex. Head	.08
7	404	A1-21820	Short Incline Stop Bracket and Nut Assembly	.24
7		B1-21819	Incline Table and Table Lift Arm Assembly: Includes Ref. No's. 405 Thru 428	6.66
7	405	A9-12670	"E" Ring, 1/4"	.08
7	406	A3-21251	Arm, Table Lifter Transfer	.25
7	407	A3-21288	Arm, Table Lift	.22
7	408	A9-13199	"E" Ring, 1/8"	.08
7	409	A4-21404	Pin, Incline Table	.08
7	410	B3-21283	Arm, Changer Incline Lifter	.13
7	411	A9-11888	"E" Ring, 3/16"	.08
7	412	A4-21398	Crank Link Pin, Incline Lifter	.15
7	413	A15-21607	Arm Roller, Incline Lifter	.08
7	414	A4-21399	Shaft, Incline Lifter Arm Roller	.08
7	415	A4-21406	Shaft, Table Lift Arm Pivot	.08
7		B1-21828	Incline Frame and Stack Table Assembly: Includes Ref. No's. 416 Thru 420	2.27
7	416	B1-21830	Incline Frame and Lifter Arm Roller Retainer Assembly	.91
7	417	A9-21455	Retaining Ring, Circular Self-Locking (4 Used)	.08
7	418	A4-21400	Shaft, Incline Table Roller (3 Used)	.09
7	419	A15-14450	Slide Roller (6 Used)	.08
7	420	C15-21605	Table, Changer Stack	.44
7		B1-21829	Cartridge Table Frame and Changer Incline Frame Assembly: Includes Ref. No's. 421 Thru 428	1.72
7	421	A1-21129	Cartridge Table Frame Assembly	.56
7	422	A9-21452	Switch, Tape Platform	3.02
7	423	A14-21582	Screw, #2-56 Slotted Fillister Head	.08
7	424	A9-17376	Retaining Ring, Circular Self-Locking (4 Used)	.08
7	425	A4-21400	Shaft, Incline Table Roller (3 Used)	.09
7	426	A15-14450	Slide Roller (6 Used)	.08
7	427	A15-21632	Button, Switch Actuating	.08
7	428	C15-21606	Table, Changer Load	.44
7	429	A13-21542	Torsion Spring, Incline Lifter Arm	.08
7	430	A4-21403	Shaft, Incline Lifter Arm	.23
7	431	A9-11888	"E" Ring, 3/16"	.08
7	432	A3-21302	Arm, Cartridge Sensing	.28
7	433	A3-21303	Bracket, Cartridge Sensing Switch	.27
7	434	A13-21573	Torsion Spring, Changer Load Table and Cartridge Sensing Switch	.08
7	435	A1-21822	Switch, Tape Cartridge Sensing	.41

ELECTRICAL PARTS LIST

TUBES

Fig. No.	Ref. No.	Part No.	Description	List Price
20	V1	B120-24	6EU7, Left Channel Preamplifier	2.15
20	V2	B120-24	6EU7, Left Channel AF Amplifier	2.15
20	V3	B120-25	7591, Left Channel Output	2.50
20	V4	B120-24	6EU7, Right Channel Preamplifier	2.15
20	V5	B120-24	6EU7, Right Channel Output	2.15
20	V6	B120-25	7591, Right Channel Output	2.50
20	V7	B120-4	6C4, Erase/Bias Oscillator	1.50

CAPACITORS

Fig. No.	Ref. No.	Part No.	Description	List Price
20	C1A	A119-23	60 mfd @ 350V, Electrolytic	3.01
	B		50 mfd @ 350V, Electrolytic	
	C		50 mfd @ 350V, Electrolytic	
20	C2A	A119-17A	20 mfd @ 300V, Electrolytic	2.18
	B		20 mfd @ 300V, Electrolytic	
	C		25 mfd @ 300V, Electrolytic	
21	C3	B115-7	.22 mfd @ 100V, Molded Tubular	.47
21	C4	B112-7	750 mmf, 10%, Ceramic Disc	.32
21	C5	B114-1	.01 mfd, 20%, Ceramic Disc	.19
21	C6	B115-1	.1 mfd @ 100V, 30%, Molded Tubular	.28
21	C7	B113-1	.001 mfd, 20%, Ceramic Disc	.19
21	C8	B114-11	.05 mfd, +80-20%, Ceramic Disc	.55
21	C9	B113-1	001 mfd, 20%, Ceramic Disc	.19
21	C10	B114-1	.01 mfd, 20%, Ceramic Disc	.19
21	C11	B114-12	.022 mfd @ 100V, 10%, Molded Tubular	.26

CAPACITORS (Cont'd.)

Fig. No.	Ref. No.	Part No.	Description	List Price
21	C12	B114-1	.01 mfd, 20%, Ceramic Disc	.19
21	C13	B113-13	5000 mmf, 2.5%, Polystyrene Tubular	.24
21	C14	B114-11	.05 mfd, +80-20%, Ceramic Disc	.55
21	C15	B115-5	.1 mfd @ 400V, 20%, Molded Paper Tubular	.19
21	C16	B114-11	.05 mfd, +80-20%, Ceramic Disc	.55
21	C17	B113-1	.001 mfd, 20%, Ceramic Disc	.19
21	C18	B115-7	.22 mfd @ 100V, Molded Tubular	.47
21	C19	B112-7	750 mmf, 10%, Ceramic Disc	.32
21	C20	B114-1	.01 mfd, 20%, Ceramic Disc	.19
21	C21	B115-1	.1 mfd @ 100V, 30%, Molded Tubular	.28
21	C22	B113-1	.001 mfd, 20%, Ceramic Disc	.19
21	C23	B114-11	.05 mfd, +80-20%, Ceramic Disc	.55
21	C24	B113-1	.001 mfd, 20%, Ceramic Disc	.19
21	C25	B114-1	.01 mfd, 20%, Ceramic Disc	.19
21	C26	B114-12	.022 mfd @ 100V, 10%, Molded Tubular	.26
21	C27	B114-1	.01 mfd, 20%, Ceramic Disc	.19
21	C28	B113-13	5000 mmf, 2.5%, Polystyrene Tubular	.24
21	C29	B114-11	.05 mfd, +80-20%, Ceramic Disc	.55
21	C30	B115-5	.1 mfd @ 400V, 20%, Molded Paper Tubular	.19
21	C31	B114-11	.05 mfd, +80-20%, Ceramic Disc	.55
21	C32	B113-1	.001 mfd, 20%, Ceramic Disc	.19

ELECTRICAL PARTS LIST (Cont'd.)

CAPACITORS (Cont'd.)

Fig. No.	Ref. No.	Part No.	Description	List Price
21	C33	B112-10	500 mmf, Mica	.27
21	C34	B115-1	.1 mfd @ 100V, 30%, Molded Paper Tubular	.28
21	C35	B113-3	2000 mmf, Mica	.61
21	C36	B114-1	.01 mfd, 20%, Ceramic Disc	.19
21	C37	A142-3	Trimmer, Mica	.46
21	C38	A142-3	Trimmer, Mica	.46
21	C39	B113-8	.005 mfd @ 1000V, 20%, Ceramic Disc	1.14
21	C40	B114-11	.05 mfd, +80-20%, Ceramic Disc	.55
21	C41	B114-1	.01 mfd, 20%, Ceramic Disc	.19
21	C42	B114-1	.01 mfd, 20%, Ceramic Disc	.19

CONTROLS AND RESISTORS

Fig. No.	Ref. No.	Part No.	Description	List Price
22	R1A	B140-29	200KΩ, Tap @ 100KΩ; Volume Control and Erase/Bias On-Off Switch (Left Channel)	3.20
22	R1B		200KΩ, Tap @ 20KΩ; Tone Control (Left Channel)	
22	R2	A140-13	250Ω, 1st Hum Control (Left Channel)	.55
22	R3	A140-13	250Ω, 2nd Hum Control (Left Channel)	.55
23	R4A	B140-29	200KΩ, Tap @ 100KΩ; Volume Control and Erase/Bias On-Off Switch (Right Channel)	3.20
23	R4B		200KΩ, Tap @ 20KΩ; Tone Control (Right Channel)	
23	R5	A140-13	250Ω, 3rd Hum Control (Right Channel)	.55
23	R6	A140-13	250Ω, 4th Hum Control (Right Channel)	.55
22	R7	B103-20	22KΩ, 1/4 Watt, 10%, Carbon	.09
22	R8	B105-1	1 meg, 1/4 Watt, 20%, Carbon	.10
22	R9	B105-5	10 meg, 1/4 Watt, 20%, Carbon	.10
22	R10	B103-21	10KΩ, 1/4 Watt, 20%, Carbon	.08
22	R11	B104-23	470KΩ, 1/2 Watt, 5%, Carbon	.35
22	R12	B100-5	10Ω, 1/2 Watt, 10%, Carbon	.10
22	R13	B105-2	2.2 meg, 1/4 Watt, 20%, Carbon	.10
22	R14	B104-22	220KΩ, 1/4 Watt, 10%, Carbon	.32
22	R15	B105-4	5.6 meg, 1/4 Watt, 10%, Carbon	.09
22	R16	B105-5	10 meg, 1/4 Watt, 20%, Carbon	.10
22	R17	B105-5	10 meg, 1/4 Watt, 20%, Carbon	.10
22	R18	B104-26	220KΩ, 1/2 Watt, 5%, Carbon	.09
22	R19	B103-9	47KΩ, 1/2 Watt, 10%, Carbon	.10
22	R20	B103-20	22KΩ, 1/4 Watt, 10%, Carbon	.09
22	R21	B103-20	22KΩ, 1/4 Watt, 10%, Carbon	.09
22	R22	B104-5	220KΩ, 1/2 Watt, 10%, Carbon	.10
22	R23	B102-12	1800Ω, 1/2 Watt, 10%, Carbon	.10
22	R24	B105-1	1 meg, 1/4 Watt, 20%, Carbon	.10
22	R25	B104-5	220KΩ, 1/2 Watt, 10%, Carbon	.10
22	R26	B102-12	1800Ω, 1/2 Watt, 10%, Carbon	.10
22	R27	B102-5	2700Ω, 1/2 Watt, 10%, Carbon	.09
22	R28	B104-9	470KΩ, 1/2 Watt, 20%, Carbon	.10
22	R29	B103-2	10KΩ, 1/2 Watt, 20%, Carbon	.09
22	R30	B101-13	125Ω, 3 Watts, 10%, Wirewound	.24
22	R31	B104-11	560KΩ, 1/2 Watt, 10%, Carbon	.10
22	R32	B104-18	100KΩ, 1 Watt, 10%, Carbon	.10
22	R33	B104-14	100KΩ, 1/2 Watt, 10%, Carbon	.10
22	R34	B105-1	1 meg, 1/4 Watt, 20%, Carbon	.10
22	R35	B104-4	150KΩ, 1/2 Watt, 20%, Carbon	.09
22	R36	B104-11	560KΩ, 1/2 Watt, 10%, Carbon	.10
22	R37	B101-2	220Ω, 1/2 Watt, 20%, Carbon	.08
22	R38	B103-5	18KΩ, 1/2 Watt, 10%, Carbon	.08
22	R39	B100-7	22Ω, 1 Watt, 10%, Carbon	.13
23	R40	B103-20	22KΩ, 1/4 Watt, 10%, Carbon	.09
23	R41	B105-1	1 meg, 1/4 Watt, 20%, Carbon	.10
23	R42	B105-5	10 meg, 1/4 Watt, 20%, Carbon	.10
23	R43	B103-21	10KΩ, 1/4 Watt, 20%, Carbon	.08
23	R44	B104-23	470KΩ, 1/2 Watt, 5%, Carbon	.35
23	R45	B100-5	10Ω, 1/2 Watt, 10%, Carbon	.10
23	R46	B105-2	2.2 meg, 1/4 Watt, 20%, Carbon	.10
23	R47	B104-22	220KΩ, 1/4 Watt, 10%, Carbon	.32
23	R48	B105-4	5.6 meg, 1/4 Watt, 10%, Carbon	.09
23	R49	B105-5	10 meg, 1/4 Watt, 20%, Carbon	.10
23	R50	B105-5	10 meg, 1/4 Watt, 20%, Carbon	.10
23	R51	B104-26	220KΩ, 1/2 Watt, 5%, Carbon	.09
23	R52	B103-9	47KΩ, 1/2 Watt, 10%, Carbon	.10
23	R53	B103-20	22KΩ, 1/4 Watt, 10%, Carbon	.09
23	R54	B103-20	22KΩ, 1/4 Watt, 10%, Carbon	.09

CONTROLS AND RESISTORS (Cont'd.)

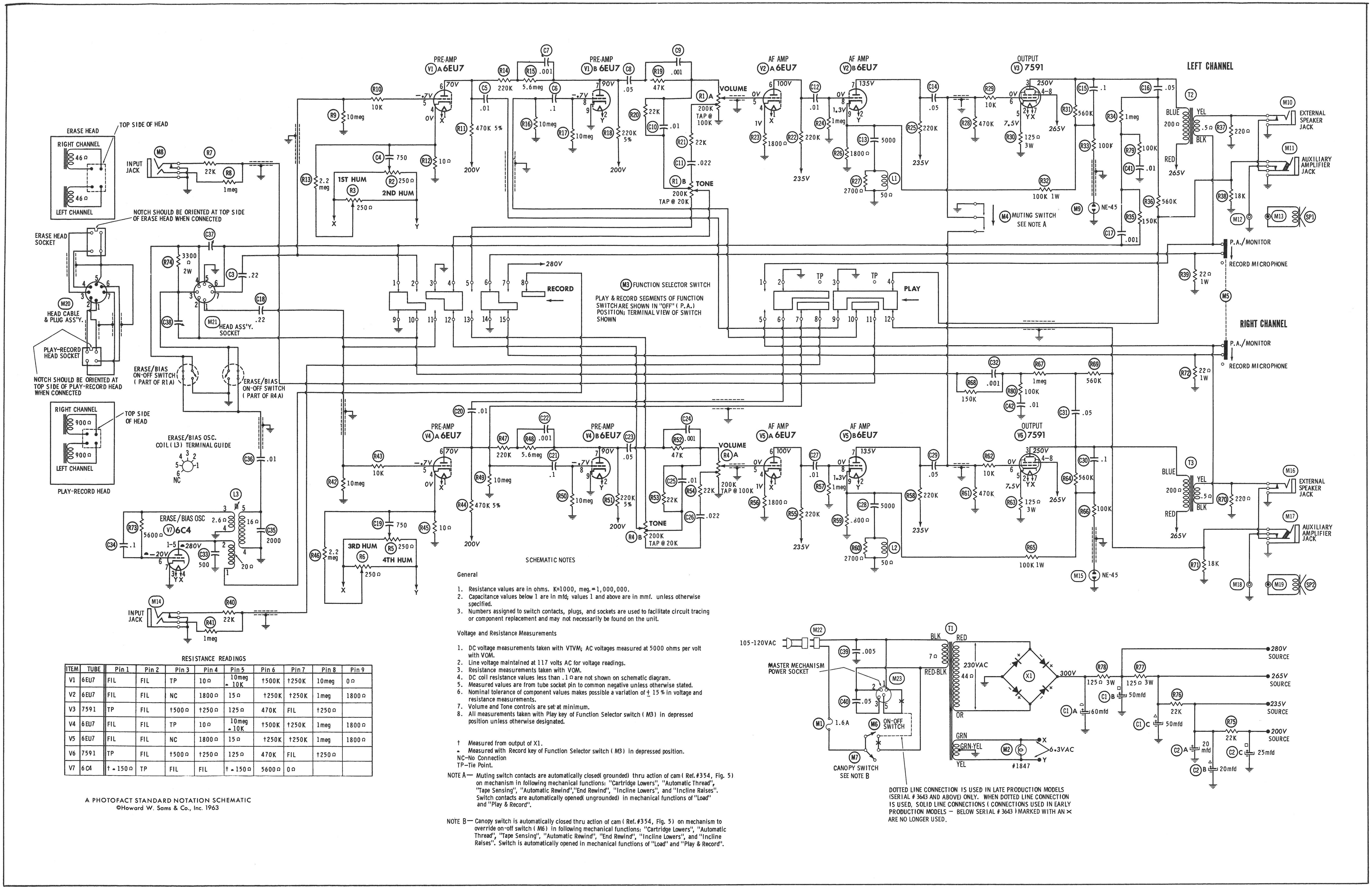
Fig. No.	Ref. No.	Part No.	Description	List Price
23	R55	B104-5	220KΩ, 1/2 Watt, 10%, Carbon	.10
23	R56	B102-12	1800Ω, 1/2 Watt, 10%, Carbon	.10
23	R57	B105-1	1 meg, 1/4 Watt, 20%, Carbon	.10
23	R58	B104-5	220KΩ, 1/2 Watt, 10%, Carbon	.10
23	R59	B102-12	1800Ω, 1/2 Watt, 10%, Carbon	.10
23	R60	B102-5	2700Ω, 1/2 Watt, 10%, Carbon	.09
23	R61	B104-9	470KΩ, 1/2 Watt, 20%, Carbon	.10
23	R62	B103-2	10KΩ, 1/2 Watt, 20%, Carbon	.09
23	R63	B101-13	125Ω, 3 Watts, 10%, Wirewound	.24
23	R64	B104-11	560KΩ, 1/2 Watt, 10%, Carbon	.10
23	R65	B104-18	100KΩ, 1 Watt, 10%, Carbon	.10
23	R66	B104-14	100KΩ, 1/2 Watt, 10%, Carbon	.10
23	R67	B105-1	1 meg, 1/4 Watt, 20%, Carbon	.10
23	R68	B104-4	150K, 1/2 Watt, 20%, Carbon	.09
23	R69	B104-11	560KΩ, 1/2 Watt, 10%, Carbon	.10
23	R70	B101-2	220Ω, 1/2 Watt, 20%, Carbon	.08
23	R71	B103-5	18KΩ, 1/2 Watt, 10%, Carbon	.08
23	R72	B100-7	22Ω, 1 Watt, 10%, Carbon	.13
23	R73	B102-15	5600Ω, 1/2 Watt, 10%, Carbon	.08
23	R74	B102-6	3300Ω, 2 Watts, 20%, Wirewound	.34
23	R75	B103-7	22KΩ, 1/2 Watt, 20%, Carbon	.10
23	R76	B103-7	22KΩ, 1/2 Watt, 20%, Carbon	.09
23	R77	B101-13	125Ω, 3 Watts, 10%, Wirewound	.24
23	R78	B101-13	125Ω, 3 Watts, 10%, Wirewound	.24
23	R79	B104-1	100KΩ, 1/2 Watt, 20%, Carbon	.10
23	R80	B104-1	100KΩ, 1/2 Watt, 20%, Carbon	.10

COILS AND TRANSFORMERS

Fig. No.	Ref. No.	Part No.	Description	List Price
22	L1	A133-10	Peaking Coil (Left Channel)	.54
23	L2	A133-10	Peaking Coil (Right Channel)	.54
23	L3	A132-17	Erase/Bias Oscillator Coil	1.11
20	T1	B130-25	Power Transformer	9.59
22	T2	A131-13	Output Transformer (Left Channel)	5.91
23	T3	A131-13	Output Transformer (Right Channel)	5.91

MISCELLANEOUS

Fig. No.	Ref. No.	Part No.	Description	List Price
23	M1	A176-2	Fuse; 1.6A	.45
20	M2	A121-5	Pilot Light; #1847	.23
23	M3	B141-58	Switch; Function Selector (Pushbutton, Slide Type)	4.14
23	M4	A141-63	Switch; Muting (Leaf Type)	.90
23	M5	A141-67	Switch; P.A./Monitor-Record Microphone (DPDT Slide Type)	.29
20	M6	A141-49	Switch; On-Off (Push Type)	.81
23	M7	A141-53	Switch; Canopy (SPDT, Plunger Type)	.50
22	M8	A174-24	Input Jack; Left Channel	.74
20	M9	A121-2	Neon Lamp (NE-45); Record Level Indicator (Left Channel)	1.60
22	M10	A174-5	External Speaker Jack; Left Channel	.55
22	M11	A174-48	Auxiliary Amplifier Jack; Left Channel	1.10
20	M12	A174-8	Speaker Socket; Left Channel	.08
24	M13	A173-8	Speaker Plug; Left Channel	.08
23	M14	A174-24	Input Jack; Right Channel	.74
20	M15	A121-2	Neon Lamp (NE-45); Record Level Indicator (Right Channel)	1.60
23	M16	A174-5	External Speaker Jack; Right Channel	.55
23	M17	A174-48	Auxiliary Amplifier Jack; Right Channel	1.10
20	M18	A174-8	Speaker Socket; Right Channel	.08
24	M19	A173-8	Speaker Plug; Right Channel	.08
3	M20	B196-34	Head Cable and Plug Assembly	4.05
20	M21	B171-7	Head Socket	.13
23	M22	A174-53	Power Input Socket	.11
23	M23	A174-35	Power Socket (Master Mechanism Power)	.16
4	M24	A173-23	Power Plug (Master Mechanism Power)	.09
2	SP1	C160-20	Speaker (4" x 8" PM); Left Channel	5.50
2	SP2	C160-20	Speaker (4" x 8" PM); Right Channel	5.50
23	X1	A123-7	Silicon Power Rectifier (Full Wave Bridge Type)	6.30
		B162-5H	Microphone	15.00
		C195-23	Power Cord	265 [illegible]
		A196-30	Attachment Cord Assembly	2.50
		A196-31	Hi-Fi Connecting Cable	1.37


LEFT CHANNEL
RIGHT CHANNEL
PRE-AMP V1 A 6EU7
PRE-AMP V1 B 6EU7
AF AMP V2 A 6EU7
AF AMP V2 B 6EU7
OUTPUT V3 7591
PRE-AMP V4 A 6EU7
PRE-AMP V4 B 6EU7
AF AMP V5 A 6EU7
AF AMP V5 B 6EU7
OUTPUT V6 7591
ERASE/BIAS OSC V7 6C4
VOLUME
TONE
1ST HUM
2ND HUM
3RD HUM
4TH HUM
ERASE HEAD
TOP SIDE OF HEAD
RIGHT CHANNEL
LEFT CHANNEL
NOTCH SHOULD BE ORIENTED AT TOP SIDE OF ERASE HEAD WHEN CONNECTED
ERASE HEAD SOCKET
HEAD CABLE & PLUG ASS'Y.
PLAY-RECORD HEAD SOCKET
NOTCH SHOULD BE ORIENTED AT TOP SIDE OF PLAY-RECORD HEAD WHEN CONNECTED
PLAY-RECORD HEAD
HEAD ASS'Y. SOCKET
ERASE/BIAS ON-OFF SWITCH (PART OF R1A)
ERASE/BIAS ON-OFF SWITCH (PART OF R4A)
ERASE/BIAS OSC. COIL (L3) TERMINAL GUIDE
INPUT JACK
M3 FUNCTION SELECTOR SWITCH
PLAY & RECORD SEGMENTS OF FUNCTION SWITCH ARE SHOWN IN "OFF" (P.A.) POSITION; TERMINAL VIEW OF SWITCH SHOWN
RECORD
PLAY
M4 MUTING SWITCH SEE NOTE A
EXTERNAL SPEAKER JACK
AUXILIARY AMPLIFIER JACK
P.A./MONITOR
RECORD MICROPHONE
105-120VAC
MASTER MECHANISM POWER SOCKET
ON-OFF SWITCH
CANOPY SWITCH SEE NOTE B
280V SOURCE
265V SOURCE
235V SOURCE
200V SOURCE
6.3VAC
#1847
DOTTED LINE CONNECTION IS USED IN LATE PRODUCTION MODELS (SERIAL # 3643 AND ABOVE) ONLY. WHEN DOTTED LINE CONNECTION IS USED, SOLID LINE CONNECTIONS (CONNECTIONS USED IN EARLY PRODUCTION MODELS — BELOW SERIAL # 3643) MARKED WITH AN × ARE NO LONGER USED.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6EU7	FIL	FIL	TP	10Ω	10meg ▬ 10K	†500K	†250K	10meg	0Ω
V2	6EU7	FIL	FIL	NC	1800Ω	15Ω	†250K	†250K	1meg	1800Ω
V3	7591	TP	FIL	†500Ω	†250Ω	125Ω	470K	FIL	†250Ω	
V4	6EU7	FIL	FIL	TP	10Ω	10meg ▬ 10K	†500K	†250K	1meg	1800Ω
V5	6EU7	FIL	FIL	NC	1800Ω	15Ω	†250K	†250K	1meg	1800Ω
V6	7591	TP	FIL	†500Ω	†250Ω	125Ω	470K	FIL	†250Ω	
V7	6C4	† ▬ 150Ω	TP	FIL	FIL	† ▬ 150Ω	5600Ω	0Ω		

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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SCHEMATIC NOTES

General

1. Resistance values are in ohms. K=1000, meg.=1,000,000.
2. Capacitance values below 1 are in mfd; values 1 and above are in mmf. unless otherwise specified.
3. Numbers assigned to switch contacts, plugs, and sockets are used to facilitate circuit tracing or component replacement and may not necessarily be found on the unit.

Voltage and Resistance Measurements

1. DC voltage measurements taken with VTVM; AC voltages measured at 5000 ohms per volt with VOM.
2. Line voltage maintained at 117 volts AC for voltage readings.
3. Resistance measurements taken with VOM.
4. DC coil resistance values less than .1 Ω are not shown on schematic diagram.
5. Measured values are from tube socket pin to common negative unless otherwise stated.
6. Nominal tolerance of component values makes possible a variation of ± 15 % in voltage and resistance measurements.
7. Volume and Tone controls are set at minimum.
8. All measurements taken with Play key of Function Selector switch (M3) in depressed position unless otherwise designated.

† Measured from output of X1.
▬ Measured with Record key of Function Selector switch (M3) in depressed position.
NC—No Connection
TP—Tie Point.

NOTE A— Muting switch contacts are automatically closed(grounded) thru action of cam (Ref.#354, Fig. 5) on mechanism in following mechanical functions: "Cartridge Lowers", "Automatic Thread", "Tape Sensing", "Automatic Rewind","End Rewind", "Incline Lowers", and "Incline Raises". Switch contacts are automatically opened(ungrounded) in mechanical functions of "Load" and "Play & Record".

NOTE B— Canopy switch is automatically closed thru action of cam (Ref.#354, Fig. 5) on mechanism to override on-off switch (M6) in following mechanical functions: "Cartridge Lowers", "Automatic Thread", "Tape Sensing", "Automatic Rewind", "End Rewind", "Incline Lowers", and "Incline Raises". Switch is automatically opened in mechanical functions of "Load" and "Play & Record".

Fig. 24. Schematic — Amplifier Chassis.

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